

THE IMPACT OF CHINA'S STRUCTURAL ADJUSTMENT ON ITS  
AGRICULTURAL ECONOMY

By

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Gulnaz Abdukadir

To my parents Abdukadir Ahonbay and Dilaram Anivar, my  
husband Sokrat Saydahmat, my daughter Unche Ay Saydahmat.

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The purpose of this research is twofold. The first is to define the meaning of structural adjustment within the Chinese context and to analyze the impact of price and nonprice factors on market supply and demand of agricultural commodities. The second is to draw conclusions and implications from the empirical results in regard to the structural adjustment effect on agricultural supply and demand in other similar economies. Prior studies have attempted to identify empirically factors contributing to the significant improvement of Chinese agricultural development. However, there are no comprehensive studies linking the elements of structural adjustment to agricultural growth or the effect of this growth on patterns of both rural and urban consumption and supply.



This study clarifies the elements of structural adjustment in China and builds empirical models of China's agricultural market economy on the basis of producer profit maximization and consumer utility maximization. The models are estimated by three-stage least squares using unique data from various Chinese official data sources. The estimation results indicate that the major hypotheses of the model are consistent with the data.

The major results are as follows: 1) on the supply side, price factors have a strong impact on free market supply; the coefficient for institutional organization suggests that the fewer distortions a farmer has to adjust to, the higher the work effort exerted in the market; 2) on the demand side, home produce consumption for rural consumers and rationed goods for urban consumers are both substitutable for market goods; and income elasticities in rural areas are greater than in urban areas.

This study has important implications for other centrally planned economies, and the analytical methods used in this study are applicable to the problems of those economies. One could similarly analyze impacts of factors of structural adjustment on their agricultural supply and demand and ultimately give meaningful suggestions to policy makers about how to make decisions on further economic reform.

## CHAPTER I INTRODUCTION

### Statement of the Problem

Structural adjustment has been started in socialist economies in the past decade. The former Soviet Union, the Eastern European countries, and China have begun processes of structural adjustments. Each has the intention to move from a traditional planned economy to a mixed planned-and-market economy--which will lead to a market economy. Although the elements of structural adjustment are different from country to country, the basic economic problems needing to be solved in each socialist country are similar. They all need to reform price and nonprice factors, to decentralize the economy, to open free markets, to reform ownership of publicly owned properties, etc. Facing these tremendous changes, one may raise questions, such as what is the structural adjustment in these countries? What is the behavior of the producer and consumer under both planned and mixed economy? What is the impact of these changes on the economy?

In attempting to answer these questions, I will concentrate on the structural adjustment of the Chinese economy. The reason for this choice is that the Chinese

economy is the second-largest socialist economy and the Chinese structural adjustment has been rather stable and relatively successful.

Specifically, this study will only examine the structural adjustment of Chinese agricultural economy. This is because structural adjustment in agriculture plays an important role in the Chinese economy, with reform in agriculture leading reform in industry and other sectors of the economy. Price reform and institutional reform in agriculture are much more advanced than reform in other sectors. Furthermore, in China, about 74 percent of the population lives in rural areas, and about 35 percent of the GNP is contributed by the agricultural sector. China feeds 22 percent of the world's population, with only 7 percent of the world's arable land. Clearly, China is the largest agricultural economy among the socialist countries in the world.

To study the factors of the impact of structural adjustment on the Chinese agricultural economy, an empirical supply and demand model will be developed. This model can be applied to any member of the former Soviet Union or Eastern European Countries to measure the impact of structural adjustment on their economy, to appraise policy alternatives in an agricultural sector, and finally to help make decisions on further economic reforms.

### Definition of Structural Adjustment

In the literature, the definition of the terms "adjustment," "structural adjustment," and "stabilization" are not always in agreement. If policies achieve internal and external balance, the World Bank refers to them as "stabilization." If policies make changes in the structure of incentives and institutions, the World Bank refers to these as "adjustment." If they do both, then this is referred to as "structural adjustment." More specifically, the World Bank characterizes "structural adjustment" as "reforms of policies and institutions covering microeconomic (such as taxes and tariffs), macroeconomic (fiscal policy), and institutional interventions; these changes are designed to improve allocation of resources, increase economic efficiency, expand growth potential, and increase resilience to shocks" (World Bank 1990a p.8). The World Bank defines "stabilization" as "policies (generally relying on demand management) to achieve sustainable fiscal and balance of payments current account deficits and to reduce the rate of inflation" (World Bank 1990a p.8).

Streeten (1987) indicates that, in the pursuit of a country's development objectives (such as growth, equity, poverty eradication, self-reliance, environmental protection, cultural values), countries are at times faced with major

disruptions to which they have to adjust. He defines "structural adjustment" as the adaptation to sudden or large and often unexpected changes. These changes may be favorable or unfavorable to the set of objectives pursued by a government. Gladwin (1991 p.3) stated that many adjustment packages include such as devaluation of overvalued currencies, increases in artificially low food prices and interest rates, a closer alignment of domestic prices with world prices, trade liberalization policies, decreases in government spending, wage, and hiring freezes, reductions in employment in the public sector or the minimum wage, and the removal of food and input subsidies. O'Brien (1991) states that structural adjustment means the introduction of more market-oriented policies, such as liberalization of markets, more efficient use of prices, greater openness to trade, and a bigger role for the private sector. Elson (1989) pointed out that structural adjustment is change, and change means costs or benefits, losers or winners. Rodrik (1990) points out that, while structural adjustment is a multifaceted process, present practice emphasizes the role of economic liberalization. He argues that the emphasis on liberalization will backfire when it conflicts with the requirements of sustainability. He concludes that liberalization may often need to take a back seat to sustainability in policy-making.

Since each country has a different political and economical background, the structure of its economy is

different and the nature of its problems is different. Therefore, the elements of a structural adjustment program are different from one country to another. What is the meaning of structural adjustment in China? Is there any structural adjustment presently being undertaken in China? If so, how much structural adjustment is present? In this study we will explore these questions.

We define "structural adjustment" in China broadly as the degree of China's changes in openness to the outside world and its price and nonprice reforms. The latter includes both macro-and micro-policies and institutional reforms. Specifically, macro-policy includes the exchange-rate policy, price policy, inflation rate control policy, and government budget control policy. Micro-policy includes tax and tariff policies, import and export licensing policies, and decision-making by enterprises. Institutional reform policy in agriculture includes land policy and changes in the production responsibility system, and separation of the functions of the government and the commune. In industry, reform policy includes changes in ownership of firms, the creation of a bankruptcy system, and a new contract system. In state organizations, it includes separation of responsibilities at all levels of government organizations, separation of the responsibility of governmental agencies and enterprises, and

TABLE 1-1  
ELEMENTS OF STRUCTURAL ADJUSTMENT IN CHINA

PRICE REFORM	NONPRICE REFORM
1) Exchange rate policy 2) Farm product price policy 3) Industry product price policy 4) Government budget control 5) Control inflation 6) Interest rate policy 7) Tax, Tariff, Subsidies 8) Wage payment	1) Agriculture land use right 2) Production responsibility system 3) Abolition of commune system 4) Separation of function of government and production 5) Contract system 6) Bankruptcy law 7) Ownership of the firm 8) Decision-making of enterprises 9) Streamlining of government organization 10) Commercialization of real estate

in terms of administrative structure, streamlining over-staffed governmental organizations. These elements of structural adjustment are summarized in Table 1-1.

Obviously, structural adjustment in China includes many important elements. In this study I will confine myself to how structural adjustment in agriculture affects China's market supply and demand.

The ultimate purpose of structural adjustment in China is to achieve economic growth. The specific strategy for development was, first, to double the GNP in the 1980s so as to solve the long-standing problem of feeding and clothing all the Chinese people. This was achieved by 1987. The second goal was to redouble its GNP by the end of this century. By then, China will be comparatively strong and its people able to live a comfortable life. The third goal was, by the middle of the next century, to become a moderately developed country. The necessary faster growth required for this goal to be met can be achieved by the removal of structural rigidity, which impedes growth. Another condition which requires structural adjustment deals with domestic distortions, which cause static efficiency losses.<sup>1</sup> The removal of domestic distortions is

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<sup>1</sup> China's Centrally Planned Economy (CPE) has always lacked a comprehensive centralized information system, so central control has often proved to be excessively rigid and ineffective. The static benefits are those associated with the more efficient allocation of domestic resources that results when a country engages in trade; the efficient resources allocation is consistent with the country's international competitiveness and makes possible a higher level of national income than that without trade.



expected to lead to more efficient resource allocation and higher income in the long run.

### The Performance of China's Economic Planning System

After the People's Republic of China was established in 1949, the Chinese communists addressed the task of transforming the war-torn market-oriented economy into a command economy. The communist government was against land owners and industrialists and took away their privately owned property for the state. It sought financial and technical assistance from the Soviet Union in its effort to rebuild the economy. By 1956, nearly all enterprises had been nationalized. China's planning system was modeled on Soviet practices, but China started central planning with a much narrower industrial base and a much lower degree of economic development than did the Soviet Union in 1928. In the First Five-Year Plan (1952-57), serious sectoral imbalances occurred in the economy. The primary reason was a biased investment policy which focused on the heavy industrial sector, with little attention paid to agriculture and light industry (Table 1-2).

Heavy industry was still the core of the economic development program in the Second Five-Year Plan (1958-62). As the government explained, it was a solid foundation for strong economic power and national defense. Shortly after the Plan was launched, Mao started three vigorous movements known

TABLE 1-2  
INVESTMENT IN CAPITAL CONSTRUCTION BY SECTORS  
(at current price in renminbi billion yuan)

	Agri- culture	Light industry	Heavy industry	Other	Total
1953-57	4.2	3.8	21.3	29.6	58.8
1958-62	13.6	7.7	65.2	34.2	120.6
1963-65	7.5	1.7	19.4	13.7	42.2
1966-70	10.4	4.3	49.9	33.0	97.6
1971-75	17.3	10.3	87.5	61.3	176.4
1976-80	24.6	15.6	107.6	86.4	234.2
1978	5.3	2.9	24.4	17.4	50.1
1979	5.8	3.1	22.6	20.9	52.3
1980	5.2	5.1	22.5	23.1	55.9
1981	2.9	4.3	17.3	19.8	44.3
1982	3.4	4.7	21.4	26.1	55.6
1983	3.6	3.9	24.4	27.6	59.4
1984	3.7	4.2	29.9	36.4	74.3
1985	3.7	6.3	38.3	59.1	107.4

Sources: Hsu, C.J., 1989, China's Foreign Trade Reform Cambridge University Press P.6. State Statistical Bureau, Statistical Yearbook of China (Hongkong: Economic Information and Agency, various issues).

as the Three Red Banners.<sup>2</sup> These movements terminated the Second Five-Year Plan and resulted in chaos in the Chinese economy. Also in 1960, the unexpected withdrawal of all Soviet economists and technicians working in China exacerbated the existing chaotic situation. Facing nationwide famine in the early 1960s, the government formulated four guidelines for economic recovery.<sup>3</sup> At the end of the adjustment period (1961-65), the shares of agriculture, light industry, and heavy industry in the economy were 29.74%, 35.43% and 34.83%, respectively. Thus, during this period the allocation of China's resources improved (Table 1-3).

The Third Five-Year Plan (1966 -70) was the first half of the "Cultural Revolution." During this period, heavy industry grew faster than agriculture and light industry (Table 1-4, Figure 1).

The Fourth Five-year Plan (1971-75) was the second half of the cultural revolution. During this period, two new economic policies--an open door policy and the four modernizations--were formulated, but the proportional relations among agriculture, light industry, and heavy

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<sup>2</sup> "Three Red Banners" which represented "The General Line for Socialist Construction," "The Great Leap Forward of Production," and the "People's Commune Movement."

<sup>3</sup> The Four Guidelines were known as adjustment, consolidation, enrichment, and elevation. Under these four guideline, the order of sectorial priorities of heavy industry, light industry, and agriculture was reversed, and some changes were made in commune and industry management.

TABLE 1-3  
 PERCENTAGE DISTRIBUTION OF CHINA'S ECONOMY  
 (in Gross Value of Industrial and Agricultural Production)

	1952	1957 <sup>a</sup>	1960	1965 <sup>b</sup>
Agriculture (%)	58.53	43.27	20.10	29.74
Light industry(%)	26.72	30.14	26.60	35.43
Heavy industry(%)	14.75	26.59	53.30	34.43
Total(%)	100.00	100.00	100.0 <sup>b</sup>	100.00
Total(billion Yuan)	82.70	124.10	183.75	198.40

Source: Tsao, J.T.H., 1987, China's Development Strategies and Foreign Trade Lexington Books P.27.

a. data are in terms of 1957 constant prices.

b. calculated on the basis of 1952 actual values and 1960 indexes.

TABLE 1-4  
THE GROWTH RATES OF OUTPUT BY SELECTED SECTORS  
(PERCENTAGE)

Year	Agriculture	Heavy ind.	Light ind.	Total
1956	5.06	39.74	19.68	28.06
1957	3.57	18.45	5.77	11.57
1958	2.40	78.79	33.70	54.81
1959	-13.62	48.10	22.00	36.11
1960	-12.58	25.90	-9.80	11.21
1961	-2.39	-46.50	-21.62	-38.19
1962	6.16	-22.59	-8.42	-16.61
1963	11.71	13.80	2.32	8.51
1964	13.53	21.00	17.82	19.59
1965	8.21	10.21	47.69	26.40
1966	8.68	27.50	14.51	20.91
1967	1.48	-20.00	-7.09	-13.81
1968	-2.45	-5.11	-4.91	-5.00
1969	1.15	43.90	25.21	34.30
1970	11.46	42.30	18.09	30.70
1971	3.07	21.40	6.50	14.90
1972	-0.18	7.00	6.19	6.60
1973	8.42	8.70	10.60	9.50
1974	4.15	-1.60	2.70	0.30
1975	4.61	16.80	13.00	15.10
1976	2.47	0.50	2.41	1.30
1977	1.69	14.30	14.30	14.30
1956-77 (AVERAGE)	2.69	12.29	8.65	9.62
1978	9.02	15.60	10.73	13.50
1979	8.62	7.70	9.67	8.50
1980	3.89	1.40	18.40	8.70

1981	6.60	-4.70	14.10	4.10
1982	11.08	9.80	5.70	7.70
1983	9.58	12.40	8.70	10.50
1984	17.61	14.20	13.90	14.00
1985	14.19	17.90	18.10	18.00
1979-85 (AVERAGE)	10.39	8.21	13.05	10.41

Note: All outputs are measured in constant prices.

Chinese output statistics are arrived at as the sum of the value of output at all stages of production. Therefore the net contribution of each sector to national income cannot be seen from the commodities composition of the total product of the society. In spite of this statistical deficiency, the growth rate of the output of a certain sector can be used as a good approximation of the actual growth rate of the value-added in that sector so long as the output structure in that sector is unchanged or changes very slightly over time.

Sources: Hsu, C.J., 1989, China's Foreign Trade Reform Cambridge University Press P.13. State Statistical Bureau, Statistical Yearbook of China (Hong Kong:Economic Information and Agency,1987,p.31-2).

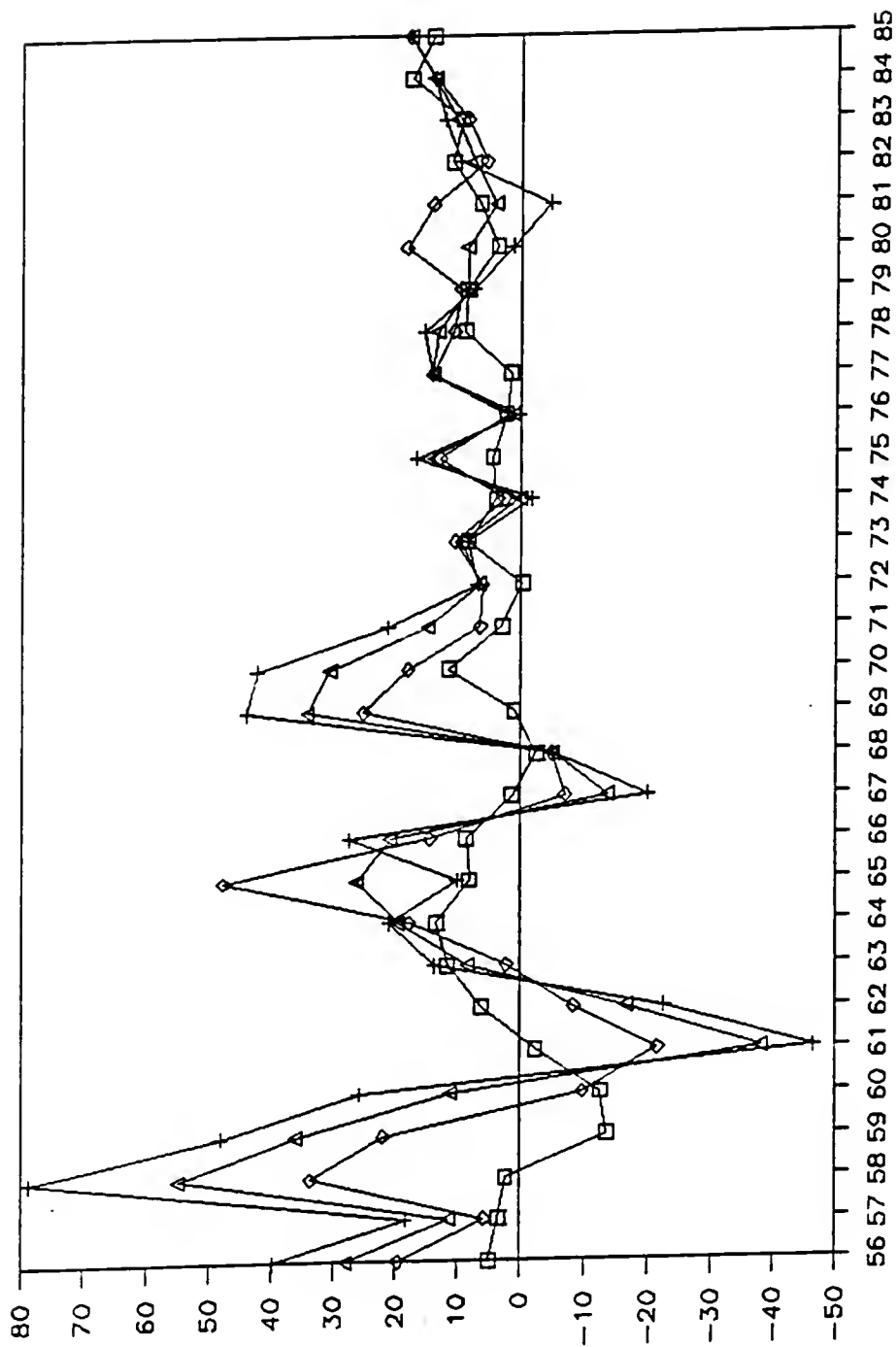


FIGURE 1. THE GROWTH RATES OF OUTPUT BY SELECTED SECTORS

□ Agriculture + Heavy Industry ◇ Light Industry △ Total

industry did not improve. In 1975 the shares of total gross output accounted by agriculture, light industry, and heavy industry were 28.53%, 30.93% and 40.54% respectively (Tsao, 1987, p.32).

The Fifth Five-Year Plan (1976-1980) has never been published. It is believed that the Fifth Five-Year Plan was developed under the leadership of Zhou and Deng. Unfortunately, power struggles terminated the plan. The Ten-Year Plan (1976-85) was prepared in accordance with Zhou's concept of the four modernizations and Mao's policy of high-speed development. A new feature of the Ten-Year Plan was a more open and liberal attitude toward foreign trade and investment in China. Due to the lack of modern technology, materials, and funds, many projects were not completed on schedule or were abandoned and resulted in the waste of human and capital resources. Facing these problems, The Three-Year Adjustment Plan was launched (1979-81). Also, in 1978, China started overall economic adjustment and reform.

The problem of macroeconomic imbalance in a centrally planned economy began with the new China established in the early 1950s. In highly closed economies, the internal policies are crucial to overall economic performance. Most of the disequilibrium has resulted from biased policies. In sum, the biased policies causing macroeconomic disequilibrium in China consist of



- Biased investment policy. Policies favored the heavy industry sector and de-emphasized investment in the consumers.
- Fixed domestic pricing policy. Prices were largely absolved of their allocative function and the government planners made the important decisions on resources allocation. The priorities of the government were high savings and low consumption.
- Urban bias. It has been and is represented by substantially higher per capita expenditures on consumption goods in urban than in rural areas, with the difference widening until 1979. Urban families have been given ever-increasing subsidies over the past four decades to prevent increases in the food prices.
- The coastal area bias. This resulted in greater emphasis on the east coast and neglect of the west interior areas. Specially, there was a transfer of resources from the western interior area to the east, a neglect of the western area's economy, and a failure to narrow the wide income gap between residents of these two areas.

In addition, the Chinese economy suffered both political and environmental shocks.

- The political shocks were both external and internal: e.g., externally, the Soviet's withdrawal of economists and technicians from China, and internally, the "Three Red Banners," the "Cultural Revolution," and various power struggles inside the party.
- The environmental shock resulted from periods of high

rainfall or drought in the early 1960s in most of China's grain production regions.

China does not, like other less developed countries, face extreme macroeconomic imbalances, such as hyper-inflation, huge external and internal debts, etc. (Table 1-5), and China's economic and political systems are relatively stable. Administrative controls, especially over prices of key products and, imports for key products, probably will continue. Therefore, macroeconomic balance is crucial during a transition toward a more efficient trade system based on decentralization of decision-making and competition.

### Objectives of the Study

China's rural structural adjustment since 1978 has made extraordinary changes in rural areas--agricultural growth, improved living condition, consumption demand shifts--which in turn have impacted on agricultural supply.

Prior studies have attempted to identify empirically the factors contributing to the significant improvement of Chinese agricultural development between 1978-84. However, there are no comprehensive studies linking the elements of structural adjustment to agricultural growth or the structural adjustment impact on consumption for both rural and urban residents and on the free market supply of the agricultural commodities.

TABLE 1-5  
MACROECONOMIC INDICATORS

ITEM/YEAR	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
GDP AT CURRENT MARKET PRICE	358.81	399.87	477.15	477.51	518.58	578.46	692.44	854.06	971.99	1135.71	1385.71	1873.11
% GROWTH RATE OF GDP		11.40	11.80	6.80	8.60	11.50	19.70	23.30	13.80	16.80	22.00	13.50
CA BAL. EXC. OFF. TRANS. (BILLIONS\$)	0.212	-0.221	-0.942	2.620	6.202	4.833	3.082	-11.19	-8.55	-0.191	-3.80	-4.59
CHANGES IN NET RESERVES (BILLIONS\$)	0.748	-0.603	-0.372	-1.925	6.275	-4.093	-1.816	4.64	1.991	-4.852	-2.23	1.62
EXCHANGE RATE (YUAN PER DOLLAR)	1.720	1.550	1.490	1.780	1.920	1.960	2.190	3.20	3.450	3.720	3.72	3.81
PRICE PARITY B/W IND. & AG. PROD.	18.000	-5.800	-4.600	-0.800	-3.300	-0.800	-4.800	-3.00	-6.400	-6.5		
(% GROWTH RATE)												
TOTAL EXTERNAL DEBT (MILLION \$)	623	21	4504	5798	8359	9609	12082	16722	23746	35428	42015	

Sources: World Bank, 1990b, China Between Plan and Market, p.107,110,116,135,164.

This study defines the meaning of structural adjustment within the Chinese context and clarifies its impact. The main objective of this study is to conduct an empirical analysis of the Chinese structural adjustment, primarily the impact of price and nonprice factors on the agricultural supply and demand. The associated specific objectives are

1. To clarify the meaning of structural adjustment in China, and to raise and to attempt to answer such questions as has there been any structural adjustment in China, and if so, how much? Has the structural adjustment been in the right direction? And what has been the impact of the structural adjustment on agricultural market supply and demand?
2. To evaluate the institutional, price, and market adjustments and to examine the behavior of producers and consumers under both planned and mixed economies.
3. To construct an empirical model for China's free market economy, and to make analyses of the price and institutional adjustment effects on the supply of and demand for agricultural goods.
4. To draw meaningful conclusions from the empirical analyses about China's structural adjustment impact on free market demand and supply, and to suggest possible extensions to other reforming centrally planned economies.

#### Organization of the Study

The study is organized as follows:

Chapter II reviews relevant theoretical and empirical literature, discusses controversies and limitations of previous studies, and, finally, indicates the direction of this study.

Chapter III reviews China's structural adjustments specifically in terms of price adjustments, institutional adjustments, and market adjustments.

Chapter IV presents the analytical framework of a Chinese aggregated agricultural goods model for a free market economy. The behavior of the production unit and consumer under both planned economy and mixed economy are discussed. The behavior of the urban and rural households in the market are treated separately. Optimizing behavior is assumed in the model. The free market supply, urban demand, and rural demand for aggregated agricultural goods are derived.

Chapter V presents sources and structure of the data, the model estimation method, and result of the regression analysis. Based on the results of the regression analysis, a detailed analysis of the estimated parameters and price and income elasticities follows.

Chapter VI includes a summary of the analyses, conclusions, and suggestions for further research.

## CHAPTER II REVIEW OF LITERATURE

### Previous Studies of Structural Adjustment

Previous studies on structural adjustment have focused on African and Latin American countries. Interest in these studies has been on implications for agriculture and the poor (Lele, 1990; Weissman, 1990; Lineberry, 1989). Also, there were discussions on the effect of structural adjustment on highly-indebted countries; the politics of stabilization and structural adjustment; debt relief and developing countries' debt crisis (Sachs, 1989).<sup>1</sup> Several studies of structural adjustment by the World Bank discuss the effectiveness of adjustment programs and examine the relationship between structural adjustment and living conditions in developing countries. The World Bank reviews issues and lessons in designing and implementing adjustment programs.(i.e. the World Bank, 1990a; 1990c). There are some IMF papers which discuss the growth and adjustment strategies of newly industrialized countries in Southeast Asia, trade regimes and export strategies, structural adjustment and public enterprise

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<sup>1</sup> This edited volume by Sachs consists of eight papers, which address the issues of debt crisis, adjustment problems in debtor countries and the international system.

performance, and the experience and the role of multilateral institutions, foreign aid, and other financial sources (i.e. Aziz, 1990; Streeten, 1988).

The essence of development is structural adjustment. Developing countries need adjustment in all sectors in order to reach their own country's objectives. Developed countries also have to adjust to a changing world and to new technologies, but their structures are more stable and less subject to change. There is some literature on structural adjustment in developed countries. The Organization for Economic Cooperation Development (OECD, 1989) reviews adjustment of the industrial structure to the changes of the shocks of the 1970s and 1980s in OECD countries, and describes the roles and effects of different policies addressing these changes. The OECD discusses public spending issues, tax reform, and structural issues arising from persistent budget deficits. Other studies have discussed the nature of the structural adjustment process in individual developed countries, such as Canada, Japan, and France (e.g., Ansari, 1989; Hayami, 1988).

#### Previous Studies of Other Centrally Planned Economies

Socialist countries account for about a quarter of the world economy, so what happens in these economies is important for all of us. The previous literature widely discussed the economic reform in Eastern European countries and those in the

former Soviet Union. Theoretical analysis of reform of market-oriented economy suggests that some combination of tax reform and debt reduction may be a precondition for market-oriented reform. The reforms may have different effects under different trade regimes; small price reforms may have perverse effects, foreign investment in a shortage economy may be immiserizing (Dinopoulos and Lane, 1992; Lane and Dinopoulos, 1991). In empirical literature, the transition from planned economy to market economy in different sectors and from different aspects is discussed. Kovacs (1991), in discussing the transition to a market economy in Hungary, presented goals and existing bottlenecks to reform. Stark (1989) analyzed Hungary's emerging mixed economy by examining a recent innovation that involves a mixture of elements from the socialist economy and private economy. Szelenyi (1989) explored the nature of the current crisis of state socialism in Eastern Europe, analyzed the reform strategies of the last decade, and speculated about alternative scenarios for a future mixed economy. Some of the literature has concentrated on the former Soviet Communist party and economic reform, what impact the attempted reform will have, and the empirical dilemmas of their interest and reform (i.e. Connor, 1989; Gomulka, 1989; Grossman, 1989; Kaser, 1989).

All these countries with centrally planned economies encounter similar problems while in the process of economic reform and structural adjustment, but each of them have their



own way to approach the problems and to try to solve them. The Chinese government has watched closely the evolving reforms in these countries and has tried to learn from them. What has been happening in the former Soviet Union lately is a good lesson; These major changes in the Soviet Union will make the Chinese government more cautious about political reform. To the extent that the Chinese government can learn from both the mistakes and successes of similar countries, they will be able to guide China as effectively and successfully as possible, given the enormous problems they face.

#### Previous Studies of Reform in China's Economy

The mainstream of recent literature on China's economic reform has been concerned with issues of price reform and the impacts of reform on the two-tier plan/market price system and specific commodity trading. In the literature it is argued that the two-tier price system has resulted in the decrease of the direct role of mandatory planning in the allocation of industrial goods, and that the inherent dynamic tendencies of the system are leading to a continual increase in the share of the market (Byrd, 1987; Reynolds, 1988a). Theoretical analyses have suggested that the mixed system is sustainable and has desirable efficiency and distributional effects, despite the effects of mandatory planning; reducing planned constraints and increasing participation in the market

economy will help the economy move from constrained toward unconstrained Pareto optimal equilibrium (Sicular, 1988b; Byrd, 1989). Some others criticize that the two-tier price system's disadvantages outweighs its advantages, but that it is acceptable as a temporary, transitional device.

Other economists concerned about China's macroeconomic problems, such as Naughton (1987), estimated a household saving function for 1957-78, showing a 3% saving rate. Applying the model to the post-1978 period, he concluded that the rapid growth of the government budget deficit was accommodated in part by voluntary saving by households and enterprises. Balasa (1987) has suggested that the Chinese economy needs to take simultaneous action in the areas of price reform: linking bonuses to work performance, establishing an effective monetary policy, rationalizing the banking system, and setting realistic interest rates. The causal relationships between monetary aggregates and macroeconomic performance were investigated by Chen (1989). He found that there is a causal relationship of currency to nominal income, the budget deficit, and the trade deficit. One-way causality runs from currency to total inflation. He concluded that the best target is currency control for monetary policy.

Other papers focused on reform in specific sectors and the impact of particular policies on trade of specific

commodities (Yoon, 1988; Halbrendt and Gempesaw, 1990; Brown, 1989).

Even though there are quite a few studies on China's economic reforms, as of yet there is no literature that discusses China's structural adjustment. The objective of this paper is to attempt to fill the lacuna, firstly, by clarify the concept of structural adjustment in China, and secondly, by analyzing the nature of structural adjustment in China and the impact of these adjustments on China's free market demand and supply.

### Agricultural Supply Response

In 1958, Marc Nerlove published a study of the supply responsiveness of U.S. farmers. The Nerlove model, hypothesizing farmer reactions based on price expectations and/or area adjustments, has been adopted, modified, even extensively revised by many authors in the last 34 years. The purpose has been to identify some of the factors that significantly affect supply responsiveness. Knowing these factors can help answer questions, such as can the policy maker influence supply responsiveness, and if so, how? In the earlier Nerlove work only a few of nonprice variables were included in the supply model employed. However, a large number of studies have attempted to gauge the effects of changes in the prices of other crops or weather variability on output. Later some economists classified some nonprice

factors, such as technical, social and political factors, which may affect the magnitude and direction of the farmer's response to price (Askari and Cummings 1976). Recent literature argues that long-run aggregate responses are greater than short-term responses and nonprice factors are more important in the long-run response than price factors (Lele 1992). Binswanger states that the overall supply response in agriculture tends to be smaller than responses to individual crops; also, aggregate output can grow only if more resources are devoted to agriculture or if technology changes (Binswanger 1990).

There are few studies which have attempted to model the reform of China agriculture; these include Lin (1992), McMillan et al. (1989), Halbrendt and Gempesaw (1990), and Carter and Zhong (1988). All these studies have tried to analyze the impact of reform on economic growth and trade in different ways. Lin, using the Cobb-Douglas production function, quantified and differentiated the contribution of the household responsibility system (HRS) from the contributions of other reforms upon output growth. However, he only looked at the impact of growth in agricultural output on the supply side and neglected to examine the impact of growth in agriculture output on demand side. Halbrendt and Gempesaw estimated a set of five equations including wheat yield, planted wheat acreage, urban and rural consumption, and wheat import. The production side of these equations did not

reflect the specific variable of the reform's contribution to the growth in production of wheat. On the consumption side, it failed to show the distortion because of governmental rationing of wheat consumption and fixing prices. McMillan *et al* used a Denison-Solow-type growth accounting technique to analyze national aggregated time-series data from 1978-1984; however, there are serious drawbacks to this study. First, their break down of growth in total factor productivity into a price component and an incentive component required strong assumptions about the reform and parameters of the utility function, and their results were sensitive to these assumptions. Second, the prices used in their analysis were above-quota procurement prices, which, theoretically, should have been the marginal prices, because above-quota price is fixed by the government. The above-quota procurement prices are usually lower than the market price, and these two types of prices might move in opposite directions. Carter and Zhong's grain production model contained separate acreage and yield equations. Their approach used population as the key policy variable in the sown-acreage response equation. Their yield equation was specified as a function of a price and a time variable that was a proxy for technology. Their rural and urban consumption equations were specified simply as a function of per capita income and lagged consumption. Lagged consumption was used to reflect the influence of consumption habits on current consumption. Both their production and

consumption equations were unable to reflect the impact of key reform variables on production and consumption.

#### Previous Studies of Agricultural Demand

Halbrendt and Gempesaw's consumption equations distinguished between the consumption behaviors of urban and rural residents by modeling urban consumption demand as a function of production plus imports and real price index, and rural consumption demand as a function of production and price index. Tang and Stone (1980) used the method of moving averages in modeling China's grain consumption. Their underlying assumption was that the total grain consumption, including human consumption, seed and feed requirements, and industrial uses is determined by the government. They also assumed that the government simply sets consumption equal to the average of supplies of the current year and the two preceding years; this is multiplied by 1.0235, which gives the long-run growth trend in grain output. After 1965, 0.5 percent of the average supply was set aside for reserves. The grain supply is calculated as output plus net imports. After the estimation of consumption, the difference between current supply and consumption is taken as the change in stock reserves. Carter and Zhong (1988) estimated a simple linear consumption model for grain, meat and spirits; they assumed that the consumption of these commodities for both urban and rural areas are the same and the quantity consumed is a

function of income and the quantity consumed last year. Their model fails to distinguish between consumption habits of urban and rural consumers; also, their model does not reflect demand distortion in China because of food rationing.

Sicular (1988b) examined the interactions between markets and state commercial planning in the context of China's agricultural sector. Using a theoretical model, Sicular analyzed the way that a mixed commercial system of the sort observed in China functions. In the absence of commercial planning, maximization of profits by the industrial producer and of utility by the urban consumer imply supply and demand functions which can be expressed as

supply/input demand functions  $q_{jk}=y_{ik}(p)$

urban consumer demand  $x_{1k}=d_{1k}(p, p_3w_{13})$

rural consumer demand  $x_{2k}=d_{2k}(p, p_3w_{23}+r_2(p))$

where  $j=0,1,2$  (when  $j=0$ , aggregate industrial production;  $j=1$ , aggregate urban consumer;  $j=2$ , aggregate farm household); where  $k=1,2,3$  (when  $k=1$ , manufactured goods;  $k=2$ , agricultural goods;  $k=3$ , aggregate farm household); and where  $w$  is initial endowments,  $p$  is price,  $q$  is production,  $y$  is supply, and  $r$  is maximum profits from farming.

Sicular also maximized the utility function for rural households under a two-tier price system, and derived rural supply and demand functions. She found that the rural supply

and demand functions are identical to those that would exist in the absence of planning, except that rural income now includes an extra component: commercial planning changes rural income by a transfer equal to the sum of trade levels with the state times the differences between state and market prices. The behavior of the urban producer and consumer is similar to that of the rural household, and the urban producer's supply and input demand functions are the same as those that would exist in the absence of state planning, except urban consumer demand also includes an extra component, a transfer based on state and free-market differences. Urban consumer demand is a function of a free-market price vector, wage income, and government transfers. Sicular concluded that the aggregate demand for an agricultural product in a mixed economy is directly affected only by free-market prices. She allowed the urban consumer the choice to consume both in the state market (up to the ration level) and in the free market, but in this case, her result always lead to urban consumption in the state market being strictly equal to the ration level. This may not adequately reflect reality in urban areas in the 1980s, because by the 1980s, a majority of urban consumers accumulated unused grain coupons in the state market.

The literature on demand includes a number of studies on the theory of household behavior under rationing. Latham (1980), using duality theory, showed that the Tobin-Houthakker conjecture (that a reduction in the ration of one type of



goods will increase the consumption of unrationed substitutes and diminishes the demand for unrationed complements) may not hold in disequilibrium situations. Neary and Roberts (1980), using the duality and the concept of "virtual" prices, derived Slutsky-type equations, and broke down the derivatives of rationed demand functions into income and substitution effects. Deaton and Muellbauer (1981), investigated the simple linkages between restricted and unrestricted demands and considered the question of perfect aggregation over consumers in the presence of quantity restrictions. Wang and Chern (1992), using pooled time series for 1981-87 and cross sectional data by income group from household expenditure surveys, examined the impacts of housing, fuel, and food-grain rationing on consumption behavior of Chinese urban households. The results show that rationing on housing and grain have had significant impacts on the demand for unrationed goods; if the current rationing system remains unchanged, Chinese urban households would continue to increase their demand for nonstaple foods, putting pressure on the food supply. A reform in housing allocation and grain rationing would significantly reduce the distortion of consumer behavior in China. Wang and Chern quantified the impact of housing, fuel, and food grain rationing on the consumption of other consumer goods and services by Chinese urban households, with special attention given to nonstaple foods and household appliances. Martin (1991) examined the theoretical

implication of rationing and subsidies using the extended linear expenditure system (ELES). His results indicated that choosing among alternative rationing models is nontrivial, as the selection prejudices the impact of rationing on savings and the consumption of unrationed commodities. There is some literature about the theory of mixed demand systems and of empirical application which expresses demand as a function of a mixed set of prices and quantities; studies have been done in this line of research by Barten (1992), Chavas (1984) and Heien (1977). There is another type of demand discussed in the literature that is conditional demand function which expresses the demand for a particular kind of goods as a function of its own price, the price of some (but not all) other goods, total expenditure on these goods, and the quantities of the remaining goods. Conditional demand functions is directly relevant to the analysis of consumer behavior under rationing (Pollak, 1969 and 1971).

### CHAPTER III THE ADJUSTMENT PROCESS

China's as well as the former Soviet Union's structural adjustment is rather special: first, because of China's size, and second, because of the centrally planned structure of the Chinese economy. Over the past forty years, the structure of Chinese economy has undergone dramatic changes in terms of its sectoral structure, the relationship between investment and consumption, its industrial structure, external trade structure, and geographic distribution of production facilities.

Simon Kuznets showed that there was an inverse relationship between a nation's size, as measured by its population, and the share of foreign trade in that country's gross national product (Kuznets 1959, 1960, 1964). Subsequent research (Chenery 1982, Wood 1986) has shown that a nation's size is also correlated with the size of its domestic market, diversified natural resources, and high internal transport cost. The relationship between a country's size and economic performance is affected by its economic efficiency and equity. As population size increases, the share of foreign trade in the GDP declines. The trade ratios for large countries are

consistently low. The possible reasons causing this are as follows:

(1) For interior regions domestic transportation costs are lower than international transportation costs.

(2) Governments favor import substitution and closed economies.

(3) These low foreign trade ratios reflect the advantages of economies of scale enjoyed by large nations.

(4) Large nations typically have a closer match between the domestic supply of key minerals and their demand for those minerals.

The most important reason is the national protection provided to domestic industries in large countries dealing with the high cost of transport from the border to the interior. However, even though a large country's ratio of foreign trade to its GDP is low, in comparison with that of a small country, the volume of foreign trade is still high. China's export/GDP ratio was 12.7% in 1989 (Table 3-1) which is high by the standard of large continental countries.

China has been a centrally planned economy (CPE). Traditionally, CPEs have been uncompetitive in the world market, but recently China's external trade has become more competitive. The principal features of the Chinese CPE were a high rate of saving and investment, collectivization of agriculture, a heavy emphasis on the development of those industries producing raw materials and investment goods which

TABLE 3-1

## CHINA: TOTAL EXPORTS AND ITS RELATIVE SHARE IN THE WORLD EXPORTS

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
China Exports	9750	13660	18188	22010	22330	22230	26129	27350	30942	39437	47541	52486
World Exports	1227170	1566610	1892520	1861440	1724730	1674610	1775830	1800080	1981390	22333200	2679560	3090000
China Exports	..	40.1	33.2	21.0	1.5	-0.4	17.5	4.7	13.1	27.5	20.5	10.7
World Exports	..	27.7	20.8	-1.6	-7.3	-2.9	6.0	1.4	10.1	17.8	14.8	15.3
				(Growth Rate)		(Percentage Share)						
China Exports into World Exports	0.8	0.9	1.0	1.2	1.3	1.3	1.5	1.5	1.6	1.7	1.8	1.7
China Exports into china GDP	4.6	5.3	6.1	7.9	8.2	7.6	8.8	9.4	11.0	12.9	12.8	12.7

Source: China Statistical Year Book 1988 p.643 for 1978-87 and Statistical Abstract 1989 p.82 for 1988.

International Financial Statistics for World Exports and Exchange Rate.  
The World Bank, Washington, D.C. 1990d.

rely on large-scale production and capital-intensive technology, and the relative neglect of investment in agriculture and consumer goods industry. CPEs constrain the rapid growth of an economy. Frequently mentioned by economists as hindering economic growth are: low productivity in agriculture, lack of capital, poor management skills, and shortage of energy. Bureaucratic management with rigid planning may be another constraint.<sup>1</sup>

The Chinese economy is currently characterized as a mixed structure under which the role of central planning has been substantially reduced, while that of market mechanisms has been expanded. Distinctive of the present stage is a two-tier price system associated with extensive use of bargaining mechanisms.<sup>2</sup> The Chinese government explain mixed economy as:

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<sup>1</sup> Perkins listed agriculture energy, foreign exchange, bureaucratic management and planning as four major economic bottlenecks to rapid growth. See China Among the Nations of the Pacific, Harrison Brown (Boulder: Westview Press, 1982), P.1-14.

<sup>2</sup> The two-tier price system was designed as a technique to alleviate the shock to the economy that would result from an abrupt shift from controlled to market-based prices. Under China's two-tier price system, planned prices are fixed by the state and non-planned prices are determined by the distorted market (Hsu, p.187). Broadly speaking, there are four sets of prices: planned (listed) prices, floating prices, negotiated prices, and free-market prices. Under the economic reforms, enterprises are required to supply to the government a certain portion of their production at fixed (planned) prices for centralized allocation, the portion depending on the perceived importance of the product to the economy. In the case of "essential" products, planned prices apply. "Nonessential" products are allowed to be sold at floating prices, negotiated prices or free-market prices. Negotiated prices are applicable to agriculture raw materials. Free-market prices are applicable to all items which are traded in market places.

the law of value and the law of proportionate development which are used as theoretical bases for the full integration of planned and market economies in China; planned regulation mainly deals with problems arising at the macro-economic level while market regulation mainly deals with problems arising at the micro-economic level. Problems of aggregate quantity and ratio and other problems of a long-term nature in the macro-economic field should be solved through planning while simple reproduction, expanded reproduction and readjustment of assets should be regulated by the market.

Since 1978, under China's "open door" policy, the trade system has evolved rapidly. The reform of the foreign trade system is an integral part of the general reform. Adjustments in agriculture and industry pushed foreign trade reform forward. Economic structural adjustments in agriculture and industry have had great impact on external trade. External trade is enhanced by the more open economic policies, improved production and freer marketing in these basic economic sectors. Also, improving the performance of institutions creates the possibility for efficient production and marketing and better external trade. Therefore, it is important to examine the adjustments in agriculture in detail.

### Adjustments in Rural Area

Discussion of rural adjustment will benefit from a brief description of how agriculture was structured in China 1978 and the measurement of structural adjustment in rural areas.

In 1978, 294 million people were employed in agriculture out of a total of 303 million collective and individual laborers in rural areas (China Statistical Yearbook, 1984 p.107 and p.109). People employed in agriculture were organized into 54,352 communes, each of which had an average of thirteen brigades, which in turn were made up of seven to ten production teams. The total population of the communes was a little more than 800 million, averaging about 15,000 per commune, and each production team averaged about thirty-five households and approximately sixty workers (Johnson,1990). The need for reform was agreed upon in Dec.1978 in the famous Third Plenary Session of the Eleventh Party Central Committee; the major reforms announced were: substantial increases in the purchase prices of eighteen farm products; increases in agricultural investment; reinstatement of the Chinese Agricultural Bank; reaffirmation of the three-level ownership of communes; approval of specialization of agricultural production according to local condition; incentives for basic farm production and supplies of farm inputs; support of village trade fairs; clarification of the role and legality of private production; reduction in rural taxes; and emphasis on



control of population growth. These reforms have evolved over time.

As the first stage, China has carried out a structural reform of rural institutions which has led to greatly increased farm production and income. A second stage of reforms is intended to lead to a market-oriented farm economy.

The process of reform was then directed at reinforcing the new structure, dismantling redundant collective institutions, and facilitating a higher degree of commercialization and specialization. The government allowed farm laborers to migrate to market towns and start their own businesses. By 1988, 95 million Chinese farmers, or one quarter of the nation's rural labor force, were involved in township enterprises and had taken jobs in industrial, commercial, and service trades (Beijing Review No.18, 1990, p.18). Many of these have become town residents. Reform of the housing system and the commercialization of real estate also allowed individuals to purchase or rent homes. In addition, the government allowed the informal credit market to generate a higher lending volume than the rural credit cooperative. The freeing up of the market for raw materials and producer goods facilitated the creation of new jobs outside of the state domain in manufacturing and services. Labor released from agriculture through productivity gains was thus absorbed in nonagricultural activities which generated improvements in allocative efficiency and hence in aggregate

productivity. Increases in standards of living provided obvious evidence of the effectiveness of these rural reform.

China, with over 20 percent of the world population, and with 85 percent of its population in agriculture, is both the world's largest producer and consumer of agricultural products; as a consequence, the supply and demand of agricultural products in China will have a major impact on world agriculture trade.

China's agricultural growth before 1978 was very slow. Despite emphasis on self-sufficiency and grain production, agriculture output barely kept pace with population growth. Since China started reform in rural areas in 1978, growth rates in all major sectors of agriculture increased dramatically (see Table 3-2). China's rural reform has been multi-faceted, including price-quota reform, institutional reform through adoption of the household responsibility system (HRS) and abolition of the people's commune, marketing reform, decentralization in output-mix decision-making, and large scale rural industrialization based on private and co-operative production. All these reforms in rural areas have contributed to agricultural growth.

In the past ten years, reform did raise the confidence of a majority of the farmers. A survey conducted by the social research center of the Ministry of Civil Affairs in 1990 showed that 66.4 percent of farmers felt that they would have a relatively comfortable life by the year 2000; 81.7 percent farmers answered that rural development would be greater in

TABLE 3-2  
AVERAGE ANNUAL AGRICULTURE GROWTH RATES, 1952-87  
(Percentage)

Sector	1952-78	1978-84	1984-87
Crops	2.5	5.9	1.4
Grain	2.4	4.8	-0.2
Cotton	2.0	17.7	-12.9
Animal Husbandry	4.0	10.0	8.5
Fishery	19.9 <sup>a</sup>	12.7	18.6
Forestry	9.4	14.9	0
Sidelines	11.2	19.4	18.5
Overall	2.9	7.7	4.1

Source: J.Y. Lin, 1992, Rural Reforms and Agricultural Growth in China. The American Economic Review, 82(1). Ministry of Agriculture Planning Bureau (1989, p.112-5,146-9,189-92) and Ministry of Agriculture(1989 p.28,34).

Note: In 1952, the weights of the five agriculture subsectors were: crops, 83.1 percent; animal husbandry, 11.5 percent; fishery, 0.3 percent; forestry, 0.7 percent; sidelines, 4.4 percent. In 1987, the weights were: crops, 60.7 percent; animal husbandry, 22.8 percent; fishery 4.7 percent; forestry, 4.8 percent, sidelines, 7.0 percent. For sidelines, outputs from village-run enterprises were excluded.

a. The low base level in 1952 is the main reason for fishery's high average annual growth during 1952-1978.

the 1990s than it was in the 1980s; 97.9 percent of the farmers felt that rural reform and development in the 1980s raised farmers' living standards to varying degrees; and a majority of the farmers were confident these gains will continue into 1990s.

### Institutional Adjustments

The major feature of the institutional adjustment is the introduction of the "Household Responsibility System" (HRS) which is designed to improve incentives and management at all levels of the rural economy. Under HRS, land is assigned to a family and the family is then responsible for meeting the procurement goals assigned to it and making payments to the village to cover certain costs, such as welfare and maintenance of joint facilities. After meeting these obligations, the family has full control over the net income realized. By 1984, 98% of agricultural households engaged in this system (see Table 3-3). Another feature of institutional adjustment is the abolition of communes. In the early 1980s, the government intention was to separate the commune's governmental functions from their economic functions, thereby reducing their monopoly power. The communes controlled almost all aspects of the lives of their members. By the end of 1983, the governmental functions were separated from the control of the commune in 11,886 communes (China Statistical Yearbook 1984, p.131), and by the end of 1984 the process was

essentially complete; only 249 communes remained in which the commune kept governmental power. With these changes the commune system lost much of its power in governing (see Table 3-4). These changes in the administrative structures of rural communities clearly increased the control that the ordinary farm family had over its affairs. Also, the government removed almost all constraints on engaging in nonagricultural activities by 1984. The emergence and eventual prevalence of the HRS, which replaces the production team system as the unit of production and income distribution, has brought about dramatic changes in China's rural areas since 1979. In the commune system, there were difficulties in monitoring agricultural work within in a team, so rewards to individual farmers were not tied directly to their efforts, and the incentive to work was thus very low (Lin 1988a). The HRS was introduced to deal with problems of shirking and mismanagement that were associated with the previous communal system. Under the HRS, the individual household became the basic unit for decision-making in agriculture production. Most aspects of collective management have been dissolved since that, with only land ownership remaining within the collective. At the end of 1978, a small number of production teams, first secretly and later with the permission of local authorities, began to try out the system of contracting land, other resources, and output quotas to individual households. A year

TABLE 3-3  
THE EVOLUTION OF OUTPUT-LINKED AGRICULTURAL PRODUCTION  
RESPONSIBILITY SYSTEMS IN CHINA

Year	All output-linked responsibility system	No. of agricultural households in output-linked responsibility system	as % of agricultural household
January 1980	29.1*		
December 1980	47.1*		
June 1981	56.4*		
October 1981	75.8*		
December 1982	82.0*		
December 1983	99.0*	179,854,000 <sup>a</sup>	97.10 <sup>a</sup>
December 1984		183,979,000 <sup>b</sup>	97.90 <sup>b</sup>

Source: \* Y.Y. Kuch, "China's second land reform, "The China Quarterly No.101(March 1985), P.125.

a. China Agricultural Yearbook, 1984, p.68-69.

b. China Agricultural Yearbook, 1985, p. 122 and 124.

TABLE 3-4  
DISBANDMENT OF THE COMMUNE SYSTEM IN CHINA

Year	Rural People's Commune	Production Brigades	Production Teams	Township (Xiang or Zhen)
1982	54,352	719.438	5,977.000	neg.
1983	40,097	550,484	5,475.000	16,252
1984	249	7,046	128,000	91,175

Source: 1982: China Agricultural Yearbook, 1983 p.19  
1983: China Agricultural Yearbook, 1984 p.67  
1984: China Agricultural Yearbook, 1985 p.121

later, these teams brought in yields far larger than those of other teams. The central authorities later admitted the existence of this form of farming, and in 1981, full official acceptance of HRS was eventually given to farmers; by that time 45 percent of the production teams in China had already been dispersed (Lin 1992 p.37). By the end of 1984, 98 percent of families operated under the responsibility system. Thus the institutional adjustment was completed by 1984.

Since 1978, the government has encouraged and emphasized maintaining the stability of HRS. During the first half of the 1980s, the agricultural gross output value (GVAO) expanded at more than double the rate of the previous 25 years. Grain production increased in volume on average by 2.1 percent. (1978-89), or about 30 percent faster than before (grain sector). But due to increasing discontent with the stagnation of grain production after 1984, the call for recollectivization has emerged, because large-sized farms can apply advanced technology with big tractors and thus increase efficiency. In some localities, this call has resulted in the disruption of contracts before their expiration without the consent of farmers (Yaping Jiang 1988). Therefore, it is possible that farmers may be deprived of the economic independence and greater freedom they had in the past 10 years (Johnson, 1990).



### Price Adjustments

The adjustment of rural prices has performed reasonably well. In part, this has been because the farm prices that prevailed in 1978 had less distortion than many industrial prices. Because in the commune system, communes were independent organizations without direct claim against the government to cover their losses, the prices paid them for farm products had to be sufficient to cover costs of purchased inputs and to pay for food and shelter for most of the peasants.

The government has had a variety of prices for farm products. There are four different types of prices: the quota price for required deliveries, a higher price for deliveries in excess of the quota, a negotiated price, and a free market price. The prices of some farm products, such as pork, poultry, eggs, fruit and vegetables, have been freed of price controls. When price inflation became serious in 1988, however, a number of cities reimposed price ceilings on several food products. The government also has provided some relief in the way of food or reduced taxes when there was a crop disaster.

Before the reforms, two distinct prices existed in the state commercial system: quota prices and above-quota prices. Quota prices apply to crops sold in fulfillment of procurement

obligations; above-quota prices apply to crops sold in excess of the obligation. The mandatory minimum delivery quota levels were reduced between 1978-82. Over these four years the national grain quotas and taxes were reduced 20 percent (Ministry of Commerce 1984, p.386-87), with reductions to some extent targeted regionally to benefit low-income and disadvantaged areas. Effective in 1979, state-planned prices for quota farm deliveries were raised by more than 20 percent, and the percentage price bonus for above-quota deliveries increased from 30 percent to 50 percent for grain and oil-bearing crops. A new 30 percent above-quota price bonus was instituted for cotton. State retail prices for grain and edible vegetable oils remained at their original levels, while retail prices of meats, vegetables, and several other nonstaple foodstuffs were increased (Sicular, 1988a, p.692). To compensate for this, each urban resident received a 5-8 yuan subsidy per month (State Statistical Bureau, 1988). As a result, the government's price subsidies increased substantially (Table 3-5). The price subsidy increased from 8.4 percent of the state budget to 24.6 percent of the state budget in 1984 (China Statistical Year Book, 1988). The state also offered negotiated purchase prices agreed on jointly by producers and local state commercial agents for voluntary above-quota deliveries to the state. Negotiated prices were to be decided based on supply and demand trends; however,

TABLE 3-5  
GOVERNMENT SUBSIDY (PERCENT OF TOTAL EXPENDITURE)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Total Subsidies	9.3	13	19	26	25	25	21	22	22	24	24
Daily necessities	6.4	11	16	21	20	18	16	14	10	11	10
Agricultural input	0.0	0.0	0.0	1.5	1.4	0.8	0.5	0.6	0.0	0.0	0.0
Enterprise Losses	2.9	2.4	2.3	2.9	3.5	6.1	4.4	7.7	12.3	13.3	13.9

Source: World Bank, 1990b, China between Plan and Market, Washington D.C.

they were, in general, not to exceed local market prices (Wang 1985, P.53). For grain, negotiated price procurement rose from less than 3 percent of net state purchases in 1978 to roughly 17 percent in 1983 (State Statistical Bureau, Dept. of Commercial and Price Statistics, 1984). These price reform policies contributed to rapid growth in the level of agricultural production and incomes, but by 1982, there were some problems, such as evasion of quota. In surplus years, increased state inventories of grain further aggravated state losses on the trade of agricultural products. Facing these problems, the state readjusted the state procurement system, beginning in 1983, by eliminating the price difference between quota and above-quota deliveries of oilseeds. The new price generally was a weighted average of 40 percent of the old quota price plus 60 percent of the old above-quota price (Wang 1985, p.52). Similar reforms occurred for cotton in 1984 (Sicular, 1988a) and then for grain in 1985.

Corresponding to these price reforms, the state government announced that grain and cotton quotas were to be replaced by a contract and market purchase. The contract price was a weighted average of the previous quota price and above-quota price. However, contract amounts were to be subject to negotiation. This change resulted in a 9.2 percent decline in the price margin paid to farmers. Following the resulting decline in production in 1983 and stagnation thereafter, the contracts were made mandatory again in 1986.

### Market Adjustments

Parallel with price reform, an exceptionally greater role was given to markets for guiding agricultural production and market decisions. The market-guided allocation of resources was introduced primarily for cash and export crops, and, to a lesser extent, for grain. Because grain procurement prices were depressed to levels lower than prevailing market prices, the more grain an area sold to the state, the more tax it paid. Provinces with a comparative advantage in grain production were thus reluctant to raise their grain output level. By contrast, grain-deficient provinces were often forced to expand the area sown in grain at the expense of higher-valued cash crops. The national self-sufficiency policy thus degenerated into regional self-sufficiency.

Since 1978, the state government realized that they cannot effectively plan for all allocations. Although planning is still considered essential for key products, they believe that markets may allocate more efficiently than state plans. The government gradually loosened restrictions on private trade for agricultural products, permitting producers to engage in private trade provided they fulfilled their delivery quotas. China has developed a plan and a market which coexist as a "mixed" economic system. Policies on the free markets were revised in two respects: both local and long-distance market exchanges were allowed and encouraged to develop. Between 1977-85, the number of markets more than

doubled, rising from 30,000 to 61,000, and the volume of trade more than quadrupled. By 1984 more than 18 percent of all purchases of agricultural products took place at market prices (Table 3-6).

As a result of these and the procurement price reforms, the production and intensification of both grains and cash crops expanded markedly between 1979-84, with much of the change in cropping pattern being in accord with regional comparative advantage. The area sown in industrial and cash crops increased from 9.6 percent of the total sown hectareage in 1978 to 13.4 percent in 1984. After the record grain harvest in 1984, mandatory procurement quotas were to be replaced by the aforementioned procurement contracts between the state and farmers for commodities still subject to planned production. As a result of these adjustments, agriculture still grew at a respectable rate of 3.4 percent (4.1% 1984-87) in 1985. The expansion in animal husbandry and aquatic products was even faster.

At the present the scope of market regulation is widening. In 1978, a total of 113 varieties of farm produce were traded according to state guidelines. Now, except for the price of only six products--grain, cotton, tobacco, raw silk, tea and timber--which are still set by the state, most farm and sideline products can be traded freely. According to Chinese official statistics, even though the number of rural markets has more than doubled since late 1970s, but the

volume of goods passing through these markets has risen 15-fold, and the area these markets cover has increased seven times. Rural wholesale markets did not exist in 1979, but by the end of 1990, there were 9,111 such markets, 164 of which counted receipts in excess of 100 million yuan each. Statistics also showed that in 1990, rural markets supplied 68.3 percent of the meat, poultry and eggs, 89.1 percent of the aquatic products, 80.3 percent of the fresh and dried fruits and 75.8 percent of the vegetables for domestic consumption. These markets have become the important source of fresh produce and sideline products for the most of the consumers.

Socialist Market Economy--a new term in reform--has arisen. Even though the plan and market combined economy began in the early 1980s, it was not until Deng Xiaoping made important statements during his South China tour early 1992 that great change took place in the national understanding of the market economy. Deng Xiaoping pointed out that a market economy is not necessarily the sole criterion to distinguish between capitalism and socialism. Under capitalism, there is economic planning, and under socialism, there should also be a market economy. The 14th National Congress of the Communist Party of China, declared that reform of China's economic structure is aimed at establishing a socialist market economic system which grew out of Deng's theory. Price reform is playing a key role in the restructuring of the Chinese economy. According to the Beijing review report based on

statistics of the State Pricing Administration, 97 percent of all retail goods have their price set by government, and only 3 percent subject to market regulation in 1978; 92.6 percent of agricultural and sideline products were sold at fixed prices, 1.8 percent at government guided prices, and 5.6 percent at market regulatory prices. In contrast, the percentage of retail goods sold at prices fixed by the government had fallen to 20.9 in 1991. Prices under government guidance were 10.3 percent of retail prices and market regulatory price increased to 68.8 percent. On the production side, 36 percent of 1991 sales were at prices fixed by the government which was a decrease of over 8.6 percent 1990's figure. Sales made under government guidance plans were 18.3 percent, which is 0.7 percent below 1990; sale at market regulatory prices were 45.7 percent, an increase of 9.3 percent from 1990. Table 3-7 shows the percentage changes in total purchases of agricultural sideline products. These figures indicate that, in last 14 years, the government regulatory prices have decreased, and market regulatory prices have been increasing.

These institutional and price adjustments in the rural area have had the following effects:



TABLE 3-6  
NATIONAL MARKET STATISTICS

	1977	1978	1979	1980	1981	1982	1983	1984	1985
Number of markets(total)	29,882	33,302	38,993	40,809	43,013	44,775	48,003	56,500	61,337
Urban	0	0	2,226	2,919	32,98	35,91	4,488	6,144	8,013
Rural	29,882	33,302	36,767	36,767	39,715	41,184	43,515	50,356	53,324
Volume of Trade (billion yuan)*	10.5	12.5	18.3	18.3	28.7	33.3	38.6	47.1	70.5
% of Total Purchases of Ag. Prod.Carried out at Market Prices	n.a.	5.6	n.a.	n.a.	9.4	10.2	10.5	18.1 <sup>+</sup>	n.a.

Source: Sicular, T. 1988b.

Ministry of Commerce (1984,p.558); State Statistical Bureau (1985, p.86-87; 1986, p.93).

\* At current prices.

+ Includes purchases by commercial, industrial, and other sectors at market prices.

TABLE 3-7  
PERCENTAGE CHANGES IN TOTAL PURCHASE OF AGRICULTURAL AND  
SIDELINE PRODUCTS

Year	Government Fixed Price	Government guided Price	Market regu- latory Price
1978	92.6	1.8	5.6
1979	88.4	4.9	6.7
1980	82.3	9.5	8.2
1981	79.1	11.5	9.4
1982	78.3	11.5	10.2
1983	76.1	13.4	10.5
1984	67.5	14.4	18.1
1985	37.0	23.0	40.0
1986	35.3	21.0	43.7
1987	29.4	16.8	53.8
1988	24.0	19.0	57.0
1989	35.3	24.3	40.4
1990	25.0	23.4	51.6
1991	22.2	20.0	57.8

Sources: Beijing Review, November 23-29, 1992.

A. Effects on output: From 1979 to 1984, agricultural output grew at an annual compound rate of 7.7 percent and increased by 56 percent (China Statistical Yearbook 1988, p.35). After that, the growth rate declined to the very respectable rate of 4 percent for 1985-1988 (China Statistical Yearbook 1988, p.35). The production growth rate from 1985-88 was almost double the rate from 1956-78, the period of peoples' communes (annual growth rate was 2.56%).

B. Effects on rural employment: Before 1978, less than 2 percent of the rural labor force was engaged in activities outside of agriculture; in 1979, nonagricultural employment increased to 31.5 million or 10.2 percent of the rural labor force. The growth of nonagricultural employment continuously increased from 1977 to 1988; agriculture employment increased by 24 million, while the number of workers in rural areas increased by 88 million. A total of 50 million non-agricultural jobs were created: 15.6 million industrial jobs, 12.0 million construction jobs, 4.8 million transportation jobs, and 5.6 million jobs in commerce and trade, representing a major achievement of local initiative (Johnson, 1990, p.40).

C. Change in sources of income: In 1978, 66 percent of the income of farm families came from the people's commune and 27 percent from household operations. The remainder came from other sources. By 1983, the income from collectives had declined to 11.6 percent of the total and the share from household production had increased to 79 percent (Table 3-8).

The relative share from household production has increased a little more since that year (China Statistical Yearbook 1988, p.732). Finally, nonfarm positions have become significantly higher sources of income than employment in agriculture.

TABLE 3-8  
SOURCES OF FARMER'S PER CAPITA INCOME IN PERCENTAGE

Year	from the collective	from the united organization	from the household management	from other non-borrowing incomes
1978	66.3	---	26.8	6.9
1980	56.6	---	32.7	10.7
1981	52.0	---	37.8	10.2
1982	21.5	---	69.4	9.1
1983	11.6	0.3	79.0	9.1
1984	10.0	0.8	80.3	8.9
1985	8.4	0.9	81.1	9.6
1986	8.5	0.7	81.5	9.3
1987	9.1	0.8	82.9	7.2
1988	9.1	0.7	83.2	7.0
1989	9.4	0.6	82.2	7.8
1990	8.8	0.3	84	6.9
1991	9.3	0.3	83.1	7.3

Sources: China Agricultural Yearbook (1985,1990).  
A Statistical Survey of China 1992.

## CHAPTER IV ANALYTICAL FRAMEWORK

### Behavior of Producers Under Planned Economy

There were two different kinds of rural enterprises in the Chinese planned economy: state farms, which were state-owned, and people's communes, which were collective-owned. Before 1979, agricultural production planning in China was very broad; for crop cultivation, mandatory targets controlled such factors as sown area, yields, levels of input applications, planting techniques, crop types and other aspects of production. Sown areas were set through a "local-central-local" process that involved both central and local levels of government. Sicular states that "The central government first set preliminary targets for provincial sown areas, the provinces then set targets for prefecture or counties, counties for communes, communes for production brigades, and brigades for production teams" (1988b, p.677). In theory, adjustment could occur at each level as targets were sent down, but in practice, the lower level had very little choice to adjust. The adjusted targets were then sent back up to central government and reaggregated, after the final targets

were specified and sent-down to local. In this process the central government played a most critical role.

In the Chinese planned economy, quotas were set with reference to the average yield of the land, that is, the amount the land should produce in an ordinary year; and once set, the quotas were not revised for three years. For many years agricultural products have been divided into three categories, each category subject to explicit commercial planning policies. The first was staple foods such as grains, edible vegetable oils and oil crops, and important cash crop such as cotton. The central government set the national quotas and nationwide procurement prices for these products under the "unified procurement and sales" (tonggou tongxiao) program, and before 1979, market trade of these products was prevented. The state set a mandatory minimum of absolute quantities to be delivered to the state at the planned prices. The second category of products was subject to "designated procurement" (paigou). Even though products belonging to this group were also planned, provinces had some choice in pricing and planning implementation. This group of products includes most of the cash crops, animal products, and side products. The third category of products was not subject to state procurement plans and could be exchanged on the market. This category largely included minor items specific to a locality.

Under the planned economy, producers had little choice in terms of what to produce, how much to produce, on where to

market. Also, there was no choice in terms of buying inputs. Each production unit acted to meet the planned target and fulfill its fixed quota.

Behavior of Producers Under Plan/Market  
Mixed Economy

The period since the 1978 reforms has been characterized by a very good performance of the agricultural sector. The gross value of agricultural output (GVAO) in 1983 grew by 9.5 percent. Since 1978, GVAO has grown at an annual average exceeding 7 percent, more than twice the rate achieved over the previous two decades. During the 1979-83 period, China's crop area declined by 3.0 percent. The area sown to grains fell by more than 4 percent, while the area under non-grains rose by 20 percent.

Factors contributing to increase production included increased use of land, labor, capital, and a more rational selection of areas planted with different crops. Improved production incentives (which include price and nonprice incentives) and greater use of purchased inputs (such as high yield seeds, chemical fertilizers and insecticide) were quite important.

Since 1978, quota price revisions were reinforced by higher above-quota price bonuses, reduced quota levels, and the selective use of encouragement sales.

The quota level for some products, most importantly the grains, were lowered. Between 1978 and 1982 the national



grain quota and tax was reduced by 20 per cent (Sicular, 1988a, p.10). The government still set minimum fixed quantity quotas and corresponding prices for first category products. The number of farm products subject to planned procurement was reduced in the first and second categories. And, the number of agricultural products not subject to mandatory procurement plans was expanded.

The government also set fixed above-quota delivery prices and willingly bought as much as farmers wished to sell at above-quota prices. Producer also faced obligatory above quota deliveries for state, but no information is available on the level of these obligations.

The government increased its participation in market trade by reviving procurement at "negotiated prices" (Yijia Shougou). These prices were to follow trends in demand and supply, but in general were not to exceed local market prices (Wang 1985, p.53). The state commercial organs sold goods purchased at negotiated retail prices which were set equal to the negotiated purchase price plus reasonable transport and handling fees.

Free market exchanges were encouraged to develop. And the number of products that could be exchanged in free markets was enlarged. However, farmers were allowed to sell their products on the market only after they had met their delivery quotas.

On first of January, 1985, the Chinese government announced that, except for a few products, it would no longer carry out unified procurement programs and will not direct quotas to farmers. For grain and cotton, required quotas were to be abolished altogether and replaced by a program of contract and market purchases. The vital points of purchasing grain through contracts were set according to the state purchase quota for grain; specify the varieties of grain to be purchased; fix prices at which grains were purchased. Put a price according to an 70 percent to be paid according to the former over-quota purchasing price and 30 percent to be paid according to the former unified-purchasing price (i.e. quota price), the surplus portion after fulfilling the contract is allowed to be marketed freely at prevailing market prices. However, if it happens that the market price of grain is lower than the original unified-purchasing price, the state will purchase at the original unified price, whatever the quantities. The quantity, variety and time of delivery are to be determined through consultation with the farmer. The complete effects of the second stage of the commercial reforms are still vague. My interview <sup>1</sup> and other literature suggest that in practice the grain contracts are not always optional but more closely parallel to the old procurement quotas, except that state procurement are narrowed (Sicular, 1988b, p.292).

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<sup>1</sup> I went to north-west China with the World Bank mission from September to November 1992, and interviewed a few local rural people.

Agriculture product supply and demand in the free market is a residual agricultural demand and supply of the state market. Therefore, government was able to use policy instruments to alter the price and quantities in the state market (both fixed quotas and above quota prices and quantities), and hence indirectly alter the exchanged quantities and prices in the free market. In the mixed economy, both price and quantity distortions were reduced, but the disequilibrium feature of the state market still existed. Most of the prices of agricultural goods were below the equilibrium levels. Hence, there was an excess demand which was controlled by a rationing coupon system in the state agricultural market. In the free market, supply and demand interaction determines price.

On the producer side, the government used quotas and quota prices as policy instruments to influence both state and free markets.

The following conceptual model of China production and supply at the household level is based on the plan/market information described above.

$Y_{ot}$  = total quantity produced in year  $t$ .

$Y_{ot} = [Y_{1t} \ Y_{2t} \ Y_{3t} \ Y_{4t}] * i,$

where,  $i$  is the sum vector

where,  $Y_{1t}$  = quota quantity

$Y_{2t}$  = above quota quantity

$Y_{3t}$  = total home consumption

$Y_{4t}$  = free market quantity

Since the quota quantity  $Y_1$  is fixed by the government and has little effect on the decision procedure at the household level, and there are certain amounts of each good is kept for home consumption, therefore  $Y_t = Y_{ot} - Y_{1t} - Y_{3t}$  will be used in the discussion below i. e.  $Y_t = [Y_2, Y_4] \cdot i$ .

Omitting the time subscript for simplification and letting  $P$  stand for price with subscripts corresponding to the  $Y$ 's, then

$$Y_2 = 0 \text{ if } P_2 < p_4$$

$$Y_2 > 0, \text{ and } Y_4 = 0 \text{ if } P_2 > p_4$$

$$\text{or } Y_4 = Y_t - Y_1 - Y_3 \text{ if } P_2 < P_4$$

$$Y_2 = Y_t - Y_1 - Y_3 \text{ if } P_2 \geq P_4$$

However, during the period in which the data used in this study were generated by the system,  $P_2 < P_4$  in each year. However, some sale under the above quota system which were made simply because farmers felt that they should offer some production to the program; these self determined sales were treated as a constraint on the optimization process and subtracted off as were the fixed quotas.

Production for the free market was therefore  $Y = f(x/z)$ , where  $x$  is a vector of variable inputs, and  $z$  is a vector of quasi-fixed inputs. Given that price expectations were formed based on government price policy and the free market environment, and letting the price of output be denoted by  $P_t$  and the

variable input prices by vector  $w$ , define the expected profit function as

$$\begin{aligned}\text{Max } \Pi &= P_t Y_t - \sum w_{it} X_{it} \\ &= P_t * f(x_{it}/z_{it}) - \sum w_{it} X_{it}\end{aligned}$$

where  $i$ =subscript for a particular input.

The first order conditions assuming unconstrained profit maximization is

$$\partial \Pi / \partial X_i = P_t f_i - w_i = 0$$

where  $f_i = \partial f / \partial x_i$ , i.e., marginal product.

From the first order condition we can solve for factor demand function as

$$X_i^* = g(P_t, w, z,)$$

Substituting this factor demand into the production function we will get the output supply function:

$$Y^* = h(P_t, w, z)$$

The factor demand functions and the output supply function are determined on the basis of the technology, as represented by the production function. Concern is with the effect of changes in input wages and output prices on the factor demand functions and output supply functions.

### Estimation of the Chinese Market Supply Function

The national level supply function (4.1) is based in part on the theory at the firm level as discussed in the previous section. The period after the structural adjustment started in rural areas is considered here because under the planned

economy there were few changes in prices and markets did not exist for most products. The functional form of the supply function after adjusting for the required quota is as follow:

$$(4.1) \quad Y_t = B_0 + B_1 P_t + B_2 FER_t + B_3 LA_t + B_4 LD_t + B_5 HRS_t + B_6 NGCA_t + B_7 MCI_t + u_t,$$

(+)      (+)      (+)      (+)      (+)      (-)      (+)

where subscript t indicates time t;

$P_t$  = free market price in year t;

$FER_t$  = quantity of manufactured fertilizer;

$LA_t$  = labor input;

$LD_t$  = land input;

$HRS_t$  = the proportion of production teams that have changed to the household responsibility system;

$NGCA_t$  = the percentage of total sown area in nongrain crop;

$MCI_t$  = the multiple cropping index;

The signs below the parameters are the expected sign.

Where the B's are the parameters to be estimated, and  $e$  is the error term. State procurement prices are announced prior to the beginning of the production season and are therefore predetermined. The free market price is based on the current year's price; this is an alternative specification of the Nerlove model. One obvious use for Nerlove's price expectation formulation in agricultural studies would be in the case of crops that take more than a single season to mature. In China, crops supplied to the in free market are mostly vegetables; multiple vegetable crops can be grown in a

season. We expect  $B_1$  is positive. The coefficient of chemical fertilize input  $B_2$  is expected have a positive sign. From above profit maximizing function, output supply is derived as a function of input price, not input quantity. The reason we did not use the fertilizer price is that the price of fertilizer is manipulated by the government and does not reflect market values; we treat the quantity of fertilizer as a quasi-fixed variable. Fertilizer allocation problems abound in China; the principal problem with the allocation system is that it is too closely tied to procurement. Almost all nationally allocated fertilizers and most provincial production is typically provided in exchange for procurement. The allocation of some county fertilizer production is sometimes diverted by county officials who use allocations to encourage compliance with various programs such as the birth control campaign (Stone 1986). We expect both labor and land have positive relationship with free market supply, so  $B_3$  and  $B_4$  are expected to be positive; because wage rate was not available so I used number of labor in the cropping sector; both labor and land is treated as fixed in short-run. In addition to the conventional variables, three nonconventional variables (HRS, NGCA, MCI) were included to assess farming institutional change, changing in cropping pattern and cropping intensity. The HRS variable alters the compensation scheme and is expected to affect the level of effort supplied by each farmer. Therefore  $B_5$  is expected to be positive. The

percentage of cash crops to total sown area (NGCA) increases as the production of grain crops decreases, since most of the cash crop is under state control, therefore as NGCA increase, the market supply of agricultural commodities decrease, so  $B_6$  is expected to be negative. The multiple cropping index (MCI) variable is included to capture the impacts of farming institutional adjustments, state price adjustments and market reforms;  $B_7$  is expected to be positive.

#### Behavior of Consumers Under a Planned Economy

It is widely agreed that there are differences between urban and rural demand in China for agricultural commodities. Urban demand is derived from the behavior of urban householders, and rural demand is mainly derived from the behavior of production teams. Under the shortage economy, the state operated a rationing coupon system for most of the food groups such as grain, meat, edible oil, sugar, tea, and other industrial commodities such as cotton, cloth, and detergents. In rural areas rationing for consumption was designed as follows: Firstly, grain producers were supposed to feed themselves with what was left after state procurement and the deduction for seed and feed. Secondly, for those whose grain output was substantially lower than the state's determined quota procurement level and those who produce industrial crops, the state would supply them with a certain amount of



food grain, and in some area also edible oil. Since 1955, the quantity of this planned supply has been fixed as a component of the "three-fix" scheme. This scheme was determined according to one's age, occupation, and local consumption level. Consumption patterns in rural areas depend on income, and income, in turn, was determined by production outputs; under the People's commune system, 90 percent of rural income was derived from collective farms; therefore, the structure of the institution had a large impact on rural consumption.

The rationing system was started in the urban areas in 1955. The rationing standard was set according to one's age and occupation. Coupons for such items as grain, oil, meat, sugar, tea, and cotton were issued to each person classified as an urban resident. Usually, these coupons were area specific. A nationally passable grain coupon was also in use for travellers and could be substituted for the area specific coupon. Most coupons were issued monthly and some were only valid for one month; others were valid for a year. Most of the grain coupons could be used any time after they were issued. The consumption pattern for urban areas was determined by personal income, ethnic group, and location. Personal income varies with occupation, skills, education, age, number of years of working experience, and location. However, the greatest income gap among social groups existed between urban and rural residents. Under the planned (rationed) economy, there was not much choice in consuming different commodities;

basically, urban inhabitants consumed according to the state issued ration coupons for basic food groups.

### Behavior of Consumers Under a Mixed Economy

For the mixed system, urban and rural demand was also considered separately. Since price and institutional adjustments started, both urban and rural consumers have had to adjust to the new economy. China Statistical household survey data provide some measure of the extent of income and consumption gains in rural China. In nominal terms, the per capita income of farmers in 1991 was 5.3 times that of 1978 (A Statistical Survey of China 1992, p.50). The income of urban dwellers rose about 63 percent during 1978 to 1991 and was 58.6 percent higher than rural income in 1991 (A statistical Survey of China, P.47 and 50). In real terms, rural income may have increased by 70 percent while urban income was up by about 40 percent; however, the urban/rural income ratio in real terms is still well over 2. Consumption gains have been substantial, between 1979 to 1991 annual per capita consumption of grain in rural China increased by only 3.2 percent while per capita consumption of vegetable oils rose by more than 188 percent. Consumption of red meat (excluding poultry) on a per head basis was up by more than 117 percent. Consumption patterns in China's rural areas continue to differ markedly from those in urban areas with rural residents

consuming substantially more grain and less meat on a per capita basis, but the patterns have been converging.

Since institutional adjustments in the rural area, the basic unit of rural consumption and production has become the individual or household. Their income and consumption levels depend on their own production, and there are more incentives for working hard. As a result, more income is generated and living standards are improved. Table 3-8 shows that, since structural adjustment started, income from household management has become an increasingly important source of income.

The rationing system has also gradually changed. Previously, some farmers were officially recognized as nongrain producers and were entitled to grain rationing. They paid the same price as urban residents, or a price only covering the quota-purchasing cost. Now they purchase grain from the free market, or state stores, paying the full cost which is equal to the above-quota price plus marketing cost. In rural areas, only selected individuals such as fisherman, herdsman and government officials can buy grain at the ration price. Ration coupons other than for grains have disappeared, and consumers can purchase freely, either in government stores or the free-market. According to a consumer expenditures survey, per capita expenditures in current prices increased from 116 yuan in 1978 to 619 yuan in 1991 (A Statistical Survey of China 1992, p.51). A large part of the expenditures was on products that were self-produced and consumed by the

farm household. When the current price expenditures were deflated to account for inflation, the resulting real expenditures was doubled over the 1978 to 1991 period. This was a remarkable outcome, especially since it followed two decades of no increase in per capita private consumption.

Another indicator that the standard of living of peasants has increased has been the decline in the percentage of their food that is self-produced (see Table 4-1).

In 1978 the peasants produced 60 percent of the food they consumed; in 1991 they only produced 33 percent of the food they consumed. The index of per capita consumption for nonagricultural residents increased 102 percent between 1978-91 (A Statistical Survey of China 1992, p.42). This was an annual growth rate of 7.9 percent compared with the growth rate for peasants of 9.5 percent.

In urban areas with its institutional and price adjustments, along with opening up of the free market, the consumption pattern also changed. These changes were based primarily on increased incomes. Incomes increased because of decentralized decision making. Many entrepreneurs became responsible for their own profit and losses and distributed bonuses according to worker performance. Hence, there have been more incentives to work hard, and more opportunities to improve their living standards. Consumption patterns also changed because of the availability of a greater variety of goods without rationing in the market. By the early 1980s, it

TABLE 4-1  
FARM HOUSEHOLD LIVING EXPENDITURE PER CAPITA (%)

Year	Purchased Articles	Self-Pro-duced Articles
1978	39.7	60.3
1980	50.4	49.6
1981	56.1	43.9
1983	58.8	41.4
1984	58.6	41.4
1985	60.2	39.8
1986	62.8	37.2
1987	64.5	35.5
1988	67.6	32.3
1989	68.6	31.4
1990	67.2	

was no longer necessary to present grain coupons when eating in restaurants, or when buying manufactured food stuffs such as cakes or cookies. The majority of urban residents accumulated unused grain coupons.

On the consumer side, the government used the ration coupon in the state market to restrict excess demand for cheap food by urban dwellers. As mentioned above, since the reform, most of the ration coupon for agricultural good have disappeared, but the basic food coupon still exists.

After the shift from a planned economy to a mixed economy, there has been a change in the structure of consumer demand both for urban and rural consumers. The amount of income has increased dramatically; both state and free-market prices play different roles; and there are now a greater variety of agricultural commodities that consumers can choose in the absence of rationing. When modeling, we need to consider all of these structural changes.

#### Consumer Demand at the Household Level Under a Mixed Economy

We assume that the objective of the consumers is to maximize utility subject to an income constraint. For rural consumers income consists of three components; namely, income from collective business  $P_1X_1$ , income from cooperative business  $P_2X_2$ , and income from household production  $P_3X_3$ . The income constraint requires that the summing of the three income components equals expenses on commercial and on self-produced

goods. For urban consumers income consists of two components, namely, basic wages of workers  $P_w W$  and bonuses  $P_b B$ . Urban consumer expenditures are, likewise, required to equal urban income.

When maximizing rural-consumer utility, we need to consider home consumption goods. On the other hand, when maximizing urban-consumer utility, we need to consider rationed goods. Following on some theoretical research on the literature (i.e. Latham and Deaton), an individual's problem is to maximize utility, assuming standard properties, i.e., it is strictly quasi concave, differentiable, and increasing function of its arguments.

$$U=U(q,b)$$

where  $q$  is the vector of unrationed free market goods and  $b$  is the rationed quantity (or home consumption for rural residents) of, say, the  $n$ th goods, subject to budget constraints

$$I_i^* \equiv Pq + P_n b,$$

where  $i = r$  and  $u$  (for rural and urban income, respectively).  $I_i^*$  is income,  $p$  is an  $(n-1)$  vector of prices of free market goods, and  $P_n$  is price of rationed goods.

Solving the problem yields the demand functions

$$q_i = f_i(I^*, p, b) \quad (i=1, \dots, n-1).$$

The above result suggests that, for this study, rural and urban consumer demand can be written as

Rural consumer demand:  $q_{rt} = f(I_{rt}, P_t, Y_{3t});$

Urban consumer demand:  $q_{ut} = f(I_{ut}, P_t, B_{ut});$

where  $I_{rt} = P_1X_1 + P_2X_2 + P_3X_3$  and  $I_{ut} = P_wW + P_bB$  indicates rural and urban income, respectively;  $Y_{3t}$  and  $B_{ut}$  indicates rural home consumption and urban rationing, respectively.

#### Estimation of Consumer Demand at the Macro Level

The theory of the household was used as a basis for specifying the macro model. A variety of functional forms have been utilized in the literature. In this study a simple linear demand function was used, and rural consumer demand can be written

$$(4.2) \quad q_{rt} = b_{0t} + b_{1t}P_t + b_{2t}I_{rt} + b_3Y_{3t} + b_4HRS_{rt} + u_{rt}$$

$$(-) \quad (+) \quad (-) \quad (-)$$

where  $q_{rt}$ =per capita quantity demanded of agricultural goods by rural consumer at time  $t$ ,

$P_t$ =free market price index of agricultural goods.

$I_{rt}$ =rural consumer per capita income.

$Y_{3t}$ =rural per capita consumption of home goods.

$HRS_{rt}$ =the proportion of production teams that have changed to the household responsibility system;

$u_{rt}$ =a residual term.

A negative relationship between rural demand and price and positive relationship between rural demand and per-capita income is anticipated; rural home consumption is expected to have a substitution relationship with free market supply or  $b_3$  is expected to be negative; HRS indicates farmers access to inputs and opportunity to grow what they desire to consume



(farmers tend to produce more home consumption goods and buy less when the opportunity exists), so  $b_4$  is expected to be negative. The HRS variable explains how institutional adjustment impacts on rural consumer behavior.

The functional form of urban consumer demand is

$$(4.3) \quad q_{ut} = a_0 + a_1 P_t + a_2 I_{ut} + a_3 B_{ut} + u_{ut}$$

$$(-) \quad (+) \quad (-)$$

where  $q_{ut}$  = per capita quantity demanded of the agricultural good by urban consumer at time  $t$ ,

$P_t$  = free market price index of the agricultural good.

$I_{ut}$  = urban consumer per capita income.

$B_{ut}$  = urban per capita consumption of rationed goods

$u_{ut}$  = residual term.

In the urban consumption equation, the free-market price of the aggregated agricultural goods is expected to have a negative relationship to urban consumption, or  $a_1$  is expected to be negative;  $a_2$  is expected to be positive as in the case of rural demand; rationed goods are expected to have substitution relationships with market demand, or  $a_3$  is expected to be negative.

#### Summarizing the Models Discussed Above

$$4.1) \text{ supply: } Y_t = B_0 + B_1 P_t + B_2 FER_t + B_3 LA_t + B_4 LD_t + B_5 HRS_t + B_6 NGCA_t + B_7 MCI_t + u_t$$

$$4.2) \text{ rural demand: } q_{rt} = b_0 + b_1 P_t + b_2 I_{rt} + b_3 Y_{3t} + b_4 HRS_{rt} + u_t$$

$$4.3) \text{ urban demand: } q_{ut} = a_0 + a_1 P_t + a_2 I_{ut} + a_3 B_{ut} + u_t$$

$$4.4) \text{ total demand: } Q_0 = \text{urban demand} + \text{rural demand}$$

$$4.5) \text{ demand} = \text{supply} + \text{net import}$$

### Classification of Variables

This system consists of 5 equations in 5 endogenous variables and 11 exogenous variables. The variables are classified and listed as below:

Endogenous variables. The endogenous variables include: Rural consumption demand ( $q_r$ ), urban consumption demand ( $q_u$ ), free market price ( $P_t$ ), total demand ( $Q_0$ ); and agricultural commodities supply ( $Y_t$ ).

Exogenous variables. The exogenous and predetermined variables include urban income ( $I_u$ ); rural income ( $I_r$ )<sup>2</sup>; rural home consumption ( $Y_3$ ); urban rationing ( $B_u$ ); per hectare

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<sup>2</sup> One might expect that the income variables in the two demand equations are endogenous as income is directly dependent on price, production (in rural areas), as well as other economic factors and policy variables (Lele and Mellor, 1981 and Mellor, 1978). To determine whether or not endogeneity of income is a problem in this study, a Hausman (1978) specification test was conducted for each demand equation. The test can be described as follow: two sets of estimates of the same parameters using the same data are obtained and then compared: one obtained using an efficient estimation technique assuming the specification is correct, and another obtained by an estimation method which is consistent. For each demand equation, first obtain estimates treating the income variable as exogenous or predetermined. Then re-estimate the equation treating income as endogenous using the instrumental variable method (the instrumental variables include all other exogenous variables in the model except urban and rural income). The test involves differencing the two sets of parameter estimates and standardizing the vector of differences by the difference in the covariance matrices of the two sets of estimates (the quadratic form computed in this way is asymptotically Chi-squared with degree of freedom equal to the number of Parameters being tested). If the coefficients of the two sets of estimates are sufficiently close, then the data suggest there is not an endogeneity problem. The Hausman test results indicate that endogeneity was not a problem in either demand equations in this study. See Appendix D for the test values.

fertilizer supply (FER); per hectare labor supply (LA); land (LD); the percentage of total sown area in nongrain crops (NGCA); the multiple cropping index (MCI); the proportion of production teams that have changed to the household responsibility system (HRS); and net imports (NI).

Identification Problem. According to the order condition of identification, we introduce the following notation:

$M$  = number of endogenous variables in the model,

$m$  = number of endogenous variables in a given equation,

$K$  = number of exogenous and predetermined variables in the model (excluding the intercepts),

$k$  = number of exogenous and predetermined variables in a given equation (again, excluding the intercept).

If  $K-k=m-1$ , the equation is just identified; but if  $K-k > m-1$ , it is over-identified. In our model:  $K=10$ ,  $M=4$ . In equations (4.1),  $m=2$  and  $k=6$ ;  $(K-k) = 4 > 1 = (m-1)$ , so the order condition suggests that the equation is over identified. In equations (4.2),  $m=2$  and  $k=3$ ;  $(K-k) = 7 > 1 = (m-1)$ , so the order condition suggests that the equation is over identified. In equation (4.3),  $m=2$  and  $k=2$ ;  $(K-k) = 8 > 1 = (m-1)$ , so the order condition suggests that the equation is also over identified.

The demand equations were estimated as a system. Systems methods are more sensitive to specification error (such as wrong functional form or exclusion of relevant variables) in one or more equations of the system. When such is the case the specification error is transmitted to the rest of the

system. One method of estimation of an over-identified equation is the method of two-stage least squares (2SLS). The 2SLS is especially designed for over-identified equations. As the name indicates, the method involves two successive applications of OLS. The basic idea behind 2SLS is to replace the stochastic endogenous explanatory variable by a linear combination of the (nonstochastic) predetermined variables in the model and use this combination as the explanatory variable in place of the original variable. A unique feature of this method is that one can estimate a single equation in a simultaneous model without worrying too much about other equations in the model; the estimates obtained are consistent; that is, as the sample increases indefinitely the estimates tend to their true population values.

The 2SLS estimator for a single equation in a multi-equation model is a limited-information estimator as complete information on all structural equations in the model is not taken into account. In principle, information on the complete structure, if correct, will yield estimators with greater asymptotic efficiency than that attainable by limited information methods. Three-Stage Least Squares (3SLS) is a full information method. A crucial question concerns the conditions under which 3SLS will be asymptotically more efficient than 2SLS. A necessary condition for the superior efficiency of a full-information, or complete system method of estimation over a limited information method is that the specification of the complete model should be correct. The 3SLS is an instru-

mental variable method for estimating a system of simultaneous equations where there may be endogenous variables on the HRS as well as contemporaneous correlation of the disturbances. The advantage of 3SLS over FIML is that model does not have to be completely specified; the estimates for the equations and parameters of interest can be consistent even if the exact form of the rest of the model is unknown. The 3SLS method involves the first two stages of 2SLS, with a third stage application of Generalized Least Squares (GLS) to the system of equations with the unknown co-variance matrix for the system replaced by the matrix of mean squares and products of 2SLS residuals.

## CHAPTER V THE MODEL ESTIMATES

### Data

The national data used in this study are from official Chinese sources and are reproduced in the Appendix B. With structural adjustment in 1978, the free market was opened and the government reduced various economic constraints on producers.

Though the data presented in the Appendix B date from 1949, only those for 1978-91 are used here. This subset of data covers the period when there was a free market for agricultural goods not under quota. In this "free markets", we assume that producers maximize profits and consumers maximize utility. Our model is neoclassical in that it is based on maximizing behavior. Before 1978, no official free market existed. However, there were some underground market activities, though statistics for this latter market are not available. A number of adjustments were made with the data. The detailed information on sources and adjustments are given below.

#### Per capita market supply of agricultural commodities.

The per capita market supply of agricultural commodities at a

national level was calculated from the total gross value of agricultural crops. Total gross value of agricultural crops includes: value of grain crops, cash crops and other crops reported in the 1991 Statistical Yearbook of China. First, Chinese official procurement prices and quantities for grain crops, edible vegetable oil, and cotton crops were used to calculate a total aggregated procurement value for these crops. Second, total rural home consumption was calculated. Finally, an aggregated agricultural commodity per capita market supply was obtained by subtracting total government procurement purchases<sup>1</sup> and total home consumption from the total gross value of agricultural crops. This was then divided by the total population. All the data used to calculate the aggregated agricultural commodity per capita market supply came from 1983-92 Statistical Yearbook of China, 1987-89 Rural Statistical Yearbook of China and China Rural Forty Years. The summary data are presented In Table A-1, Appendix A.

Total per capita demand. Total per capita demand was calculated by adding the total per capita supply to per capita net imports of aggregated commodities. This was then divided by the total population.

Net imports. The per capita net imports of aggregated agricultural commodities were calculated by using the data

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<sup>1</sup> Total government procurement refers to total purchase of all kinds of buyers.

from the UN Trade Data System network; the data is derived from partner countries (Table A-2, Appendix A).

Free market consumer goods price index. This price index came from the 1991 Statistical Yearbook of China. The original series set the index in 1950 to 100. For ease of interpretation, the series was converted to a base year of 1978. All the price indexes are summarized in Table B-3 Appendix B.

Percent of production team in household responsibility system. Structural adjustments of farming institutions were measured by the ratio of production teams participating in HRS by the end of each year. All households were in the production-team system before 1979; after 1984, over 99 percent of the teams had adopted HRS. These data came from Lin (1992), see Table A-1, Appendix A.

Multiple cropping index. This index was obtained by dividing the total agricultural sown area by the total cultivated land. The data were from USDA Agricultural Statistics of The People's Republic of China 1949-90. The 1991-92 data came from Statistical Yearbook of China (1991,92). See Table A-1, Appendix A.

Percentage of area devoted to nongrain crops. This percentage was obtained by dividing the sown acreage of non-grain crops by the total agricultural sown acreage. The data for 1949-85 came from Agricultural Statistics of the People's Republic of China 1949-85. Data from 1986-91 came from the



Statistical Yearbook of China (1987, 1991, 1992). See Table A-1, Appendix A for 1978-91 data.

Land. The data on cultivated land were taken from USDA Agricultural Statistics of the People's Republic of China 1940-90, which is measured in hectares. The data for land can also be found in the Statistical Yearbook of China. See Table A-1, Appendix A.

Labor force in the cropping sector. The data on the labor force in the cropping sector were estimated from the data on the farm labor force. Data on farm labor are provided by the USDA Agricultural Statistics of the People's Republic of China 1949-90, and the 1992 A Statistical Survey of China. The farm labor force includes those working in cropping, animal husbandry, forestry, fishery, and sideline production. To obtain an estimate of the labor force in the cropping sector, the farm labor forces were weighted by the value share of the crop output to the total agriculture output. Because crop and agricultural output may fluctuate from year to year, the values of three year averages were used in computing the weights. See Table A-1, Appendix A.

Manufactured fertilizer. This is the national application of aggregated manufactured fertilizers, measured by the total applications in nutrient weight. These data were obtained from Stone (1990). See Table A-1, Appendix A.

Per capita rural demand. Per capita rural demand was calculated by using the percent of rural population out of the total population as the weight (Table A-1, Appendix A).

Per capita urban demand. Per capita urban demand was calculated by subtracting the per capita rural demand from the total per capita demand (Table A-1, Appendix A).

Per capita income. Data for the urban per capita income came from the Statistical Yearbook of China (1983-92). The rural per capita income came from the Agricultural Yearbook of China (1985, 1990, 1991). These data are listed on Table A-1, in Appendix A.

All data in yuan were deflated by the grain market price index ( $P_{gt}$ ). The data set was used for an analysis of the impact of price and institutional adjustments on agricultural supply and demand for agricultural goods in the Chinese free-market economy.

### The Model Estimates

The model includes an aggregate agricultural supply function and rural and urban demand functions. The three equations are structured as below:

1.  $(Y_t/pop_t)/p_{gt}=f(P_t/p_{gt}, LD_t, LA_t/LD_t, FER_t/LD_t, HRS_t, NGCA_t, MCI_t)$
2.  $(q_{rt}/pop_{rt})/P_{gt}=f(P_t/P_{gt}, (I_{rt}/pop_{rt})/P_{gt}, (Y_{3t}/pop_{rt})/P_{gt}, HRS_t)$
3.  $(q_{ut}/pop_{ut})/P_{gt}=f(P_t/P_{gt}, (I_{ut}/pop_{ut})/P_{gt}, (B_{ut}/pop_{ut})/P_{gt})$

where  $Y_t$ =free market supply of aggregated agricultural goods,  
measured in billion yuan,

$POP_t$ =total population measured in thousands,

$P_{gt}$ =free market price index of grain,

$P_t$ =free market price index,

$LD_t$ =cultivated land in thousand hectares,

$LA_t$ =Labor force in cropping sector in thousands,

$FER_t$ =application of manufactured fertilizer in nutrient  
weight in thousands of tons,

$HRS_t$ =percent of production teams converted to the  
household responsibility system,

$NGCA_t$ =percentage of sown area devoted to non-grain crops,

$MCI_t$ =multiple cropping index measured in percentage,

$q_{rt}$ =per capita demand of rural consumers of aggregated  
agricultural goods measured in billion yuan,

$POP_{rt}$ =rural population measured in thousands,

$q_{ut}$ =per capita demand of urban consumers of aggregated  
agricultural goods measured in billion yuan,

$POP_{ut}$ =urban population measured in thousands,

$I_{rt}$ =per capita income of rural residents measured in yuan,

$I_{ut}$ =per capita income of urban residents measured in yuan,

$B_{ut}$ =urban per capita consumption of rationed goods  
measured in yuan,

$Y_{3t}$ =rural per capita consumption of home goods measured  
in yuan,

Using the TSP statistical package, the three equations were estimated by three-stage least squares and two-stage least squares, respectively. The three-stage least squares results are presented in Table 5-1 and the estimates for the two-stage least squares are given in Appendix C. Consistency of signs of the estimated coefficients with theoretical or prior expectations and significance of the estimated coefficient are discussed below.

### The Supply Equation

All the estimated coefficients have the expected signs. One of the strongest explanatory variables is the free-market price which, as expected, has a positive sign. For a given agricultural input, the higher the free market price of the aggregated agricultural goods, the higher the supply in the market. This confirms the hypothesis that under structural adjustment, producers have been price responsive in supplying the free-market.<sup>2</sup> Individual economic units appear to act as rational economic agents. This result provide strong evidence that price impacts supply. One of the surveys conducted by the social research center of the Ministry of Civil Affairs during 1990 showed that about 37 percent of farmers determine their planting pattern according to market demand. The

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<sup>2</sup> In preliminary analysis, lagged price and average price were also included in the model; the estimated coefficient for lagged price variable was not consistent with production theory, and the estimated coefficient of average price variable was not as good as the one using current price. Hence these variables were excluded for further analysis.

estimated coefficient of price variable is also consistent with this survey data.

Estimates of the coefficients for the production inputs (land and per hectare labor supply) are positive as expected; the estimated coefficient of land is very significant; and per hectare fertilizer application has a negative sign, but is not significant which might be caused by the allocation of fertilizer in China being closely related to various campaign programs, not by the market. These results are consistent with the economic theory (except for the fertilizer); the greater the level of the input, the greater the output is, and the higher the supply to the market.

The percentage of production teams which converted to household responsibility systems (HRS) represent an institutional adjustment for farming organization as it responds in the free-market. The estimated coefficient for HRS was asymptotically significant at the .05 level of the significance with a positive sign as expected. The result suggests the hypothesis that the fewer distortions a farmer has to adjust to, the higher the work effort exerted in the market. This in turn leads to more efficient production and higher output. This result parallels Lin's (1992) estimate that the shift from the production-team system to HRS had a positive and significant effect on agricultural growth and came primarily from increased factor productivity. Finally, the multiple cropping index is also positively and significantly

related to the free-market supply of agricultural goods. This result indicates that high cropping intensity has a strong positive impact on market supply. NGCA shows a negative but significant relationship to market supply which is consistent with the Chinese reality that cash crops are under a state procurement system. For instance, in 1990, 90.7% of the cotton was purchased under the state procurement system while only 36% of the grain was purchased by the state.

#### Urban Demand

For the urban demand equation, the free market price has a negative sign, indicating that the higher the price the lower the demand for agricultural goods. For urban residents, income is significantly and positively related to per capita demand for agricultural goods and shows a strong, positive relationship to demand. The rationing of food shows a negative and significant relationship with free market demand which indicates that the rationed goods are substitutable with market goods, i.e., the higher the quantity of rationed goods, the lower the market demand, with rationed goods usually being cheaper than free market goods. This result is consistent with Wang and Chern's finding that, if the current rationing system remains unchanged, the demand for nonstaple food can be expected to increase.

TABLE 5-1  
THREE-STAGE LEAST SQUARE ESTIMATES OF THE  
SUPPLY AND DEMAND EQUATIONS

Parameters	Estimates	Standard Errors	t-Statisti- cs <sup>a</sup>
Supply Equation:			
$C_1$	-20.7215	2.1668	-9.5630*
$P_t$	1.1226	.0839	13.3742*
$LA_t$	.17258	.1264	1.3658
$FER_t$	$-.32 \times 10^{-4}$	$.73 \times 10^{-3}$	-.0446
$LD_t$	$.10 \times 10^{-3}$	$.12 \times 10^{-4}$	8.5119*
$HRS_t$	.2109	.0722	2.9195*
$NGCA_t$	-3.7283	1.3771	-2.7073*
$MCI_t$	6.6352	1.0069	6.5892*
Urban Demand:			
$C_2$	-.0428	.0507	.8449
$P_{ut}$	-.0498	.0628	-.7935
$I_{ut}$	.0308	.0052	5.9708*
$B_{ut}$	-.0735	.0414	-1.7743

$C_3$	.3544	.1700	2.0844*
$P_{rt}$	-.0985	.2045	-.4817
$I_{rt}$	.2387	.0509	4.6886*
$Y_{3t}$	-.3955	.1003	-3.9451*
$HRS_{rt}$	-.2121	.0561	-3.7842*

a: The t-statistics marked with an \* are asymptotically significant at the .05 level.



### Rural Demand

In the rural demand equation, the free market price has a negative sign, indicating that the higher the price the lower the demand for agricultural goods. Both urban and rural price coefficients are not significant; the reason is probably due, in part, to specification and data aggregation problems. Insufficient data were available to specify a detailed demand system for narrowly defined goods. The estimated coefficient for income is significantly and positively related to per-capita demand for the agricultural goods. The estimated coefficient for home consumption shows a negative sign which indicates that the home consumption goods is substitutable for market goods. The higher the consumption of home products, the lower is the demand for market goods. This is an important finding which has not yet been discussed in the literature.<sup>3</sup> Finally, the estimated coefficient for HRS significantly and negatively related to per-capita demand, this result explains that the more access the farmers have to land and other inputs, the more home consumed goods they produce and the less demand for market goods, in other words, farmers

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<sup>3</sup> To my knowledge, the relationship between home consumption and market goods has not been studied--at least in the Chinese context. Lele (1981), using two sector model analyzed the effect of alternative assumptions with respect to distributive bias of technological change in the food-grain sector on marketable surplus and, assumed the marketable surplus of food to be influenced by the distribution of income and the different price and income elasticities of demand of landowners and laborers in the food-grain producing sector for domestic consumption of food-grains.

has more freedom in terms of production and consumption. Chinese farmers are becoming more and more integrated into the market economy, but they continue to have a strong sense of self-sufficiency. The survey mentioned earlier also shows that 43 percent of the farmers had as their first consideration about use of land producing for their own consumption. From this evidence we can conclude that the home consumption of goods is strongly substitutable for market goods.

In summary, the supply and demand functions appear to fit the data rather successfully. Nine of the fourteen estimated parameters (excluding intercepts) were twice or greater than their associated asymptotic standard error, and the signs of most of the estimated parameters are consistent with economic theory except for that of fertilizer application. The coefficient for the rationed good in the urban demand equation was also 1.8 times larger than its asymptotic standard error. That is, nine variables were asymptotically significant at the .05 significance level ( $P_t$ ,  $LD_t$ ,  $HRS_t$ ,  $NGCA_t$ ,  $MCI_t$ ,  $I_{ut}$ ,  $I_{rt}$ ,  $Y_{3t}$ ,  $HRS_{rt}$ ), and the variable  $B_{ut}$  was asymptotically significant at .10 level.<sup>4</sup>

Estimated price elasticities and income elasticities calculated at the sample mean are listed in Table 5-2, and

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<sup>4</sup> The reported goodness of fit is given by the following (adjusted R square)  $R^2$ : a) .98 for free market supply equation, b) .92 for urban demand equation, and c) .89 for rural demand equation. However, these measures are of questionable value when using a simultaneous equation method of estimation.

characterize the Chinese free market supply of and demand for agricultural goods. The estimated price elasticity of supply indicates a relatively elastic supply. A one percent increase in the (average) price of agricultural goods can be expected

TABLE 5-2  
CALCULATED ELASTICITY AT THE MEAN

Parameter	Estimates	Standard Error	t-Statistics <sup>a</sup>
I <sub>1</sub>	2.04	.15	13.37*
I <sub>2</sub>	-.40	.50	-.80
I <sub>3</sub>	1.43	.24	6.0*
I <sub>4</sub>	-.24	.51	-.48
I <sub>5</sub>	1.65	.35	4.69*

Note: I<sub>1</sub>=price elasticity of supply; I<sub>2</sub>=price elasticity of urban demand; I<sub>3</sub>=income elasticity of urban demand; I<sub>4</sub>=price elasticity of rural demand; I<sub>5</sub>=income elasticity of rural demand.

a: The t-statistics marked with an \* are asymptotically significant at the .05 level.

to result in a 2 percent increase in the (average) quantity supplied.

The estimated price elasticity of urban demand was negative. The estimate suggests that a one percent decrease in the (average) price of agricultural goods, results in a .4 percent increase in quantity demanded. The price elasticity for rural demand is .24. Both price elasticities are very low with large standard errors, as a result of the relatively large standard errors of the price coefficients in the estimated demand equations. There are a number of factors affecting the elasticity of demand. One of the most important factors is the availability of substitute goods. The higher the substitutability of the goods, the higher is the price elasticity of demand. The proportion of spending on agricultural goods to consumers' total income is another important factor influencing the price elasticity of demand. The time period and consumer expectations also affect the price elasticity of demand.

The estimated income elasticities for both rural and urban consumers were 1.65 and 1.43, respectively, which indicate that the budget share for free market agricultural goods increases as income increases;<sup>5</sup> in other words, one percent increases in rural and urban incomes resulted in 1.65

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<sup>5</sup> Since this study only looking at the crop sector, and 76 percent of free market supply of crops being vegetables, so an increase in consumers income tends to result in an increase in consumption of higher quality vegetables and the budget share for agricultural goods, overall, tends to increase.

and 1.43 percent increases in the demands for agricultural goods, respectively. The estimated parameters of both rural and urban income elasticities exceeded their associated standard errors.<sup>6</sup>

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<sup>6</sup> Mellor (1978) and Lele (1981) showed that change in relative food prices is one of the most important determinants of change in the relative and absolute real income of low-income people. They assumed income elasticities of demand for food-grains are less than one and indicated that poor people spend as much as 60 percent of income on consumption of cereals alone. The estimated income elasticity in this study is exceeded one, because most of the market goods are vegetable type rather than cereals.

## CHAPTER VI SUMMARY, CONCLUSIONS, AND POSSIBLE EXTENSIONS

### Summary

The present study analyzed structural adjustment in China in the last decade. According to the definition of structural adjustment as being the degree of China's openness to the outside world and its price and non-price reform, there are many elements of structural adjustment. Because of the limited scope of this study, I have analyzed only certain variables. Among the variables not analyzed here which also have an effect on adjustment of agriculture, inflation, government fiscal policy, and taxes.

Chapter I defined the structural adjustment in terms of China, briefly reviewed the performance of China's economic planning system, stated the problem and the objective of the study. The literature was reviewed in Chapter II. The controversies and the limitations of previous studies were discussed in this chapter.

The discussion of China's structural adjustment in Chapter III was divided into three sections: institutional adjustment, price adjustment and market adjustment.

Generally speaking, the Chinese agricultural economy is formed and operated by the government and by basic economic units--urban households as consumers and rural firms as producers and consumers. By inspecting both the structural adjustment of these basic units and the price adjustment, we explored the changing behavior of producers and consumers. Based on this, an empirical model was constructed and used to evaluate the impacts of price and institutional adjustment on market supply and demand of agricultural goods in Chapter VI.

A rather special set of data was collected to analyze the market performance of the Chinese agricultural sector (Chapter V). The development of an empirical model to analyze this data on the market economy is, in a certain sense, a breakthrough and is quite successful. Using the three-stage least square method estimates of market supply and, urban and rural demand were obtained, and the results are consistent with the real world. The methodology is potentially useful to measure the rural structural adjustment impact on supply and demand in other centrally planned economies.

### Conclusions

The theoretical understanding and empirical findings achieved from the study of the characteristic of the Chinese agricultural economy can be summarized in the following categories.



### Structural Adjustment

China has had and is continuously undergoing structural adjustment in its economy, but the adjustment is still preliminary and at a low level. If one asks if structural adjustment in China is producing change in a positive direction, my answer has to be mixed.

On the positive side, after more than ten years of economic structural adjustment, China's effort to restructure its economy has successfully transformed the traditional central planning system into one of a planned commodity economy which uses market principles as key operating measures. In terms of non-price adjustment, ownership of both agriculture and industry has been restructured. Enterprises and individuals have cultivated an awareness of their capacity to participate in market activities on their own.

The structure of ownership has had great changes. First, sole public ownership has been replaced by four economic sectors: state-owned, collective, private, and foreign-founded sectors. Second, the separation of ownership rights from managerial rights within the public sector has made enterprises increasingly more independent in the management of their own affairs and more responsible for their own profits and losses. However, some big public enterprises are still not able to be responsible for their own losses, and must be subsidized by the government.

In terms of price adjustments, prices have been readjusted to better mirror the value of commodities and the relations between supply and demand. Exchange rate devaluation was accompanied by opening up the door increasingly to the outside world for trade. The scope of markets has been gradually widened and various market systems promoted. In terms of market forms, auction and leasing markets have also been established, in addition to the original wholesale and retail markets. In terms of market variety, the newly-developed capital market, monetary market, real estate market, and foreign exchange market have also seen rapid development along with the consumer goods market. With their regularity functions strengthened, markets are playing an ever more important role in the national economy. Based on all these changes, I would answer that structural adjustment in China is going in a positive direction.

But on the other hand, there is too much government intervention in all sectors of economy. In a lot of ways, governmental intervention restricts the people's hand for further adjustment. Village and other local officials still have enormous power over the lives of farm people; there is still a long way to go before there are free and independent farmers in China. In most parts of rural China, it appears that individuals who had a great deal of authority under the commune system still have a great deal of authority in the leadership of villages and townships. These groups continue

to make many decisions that affect farm people, such as, how delivery quotas are allocated among families, the terms under which farm inputs are made available and how the income from village and enterprises are distributed. The government is not willing to give a clear definition of the property rights as affecting "land-use-rights". Probably a clear definition of property rights of farm households would greatly reduce the arbitrary power and authority of local authorities, such as, secretaries of the party at the village, township and county levels, as well as some local governmental officials. Specifically, in agricultural reform there are some important issues which are as yet unsolved. The key questions in rural reform are the ownership of land and security of rights to use the land. Several problems exist in using land.

One problem is farm-land distribution which includes the separation of ownership and usage rights and the terms of land leases given by town offices. In China, land is owned by the state or a collective. Before reform, ownership of land was by a production team, but now it is shifted to villages. But the term "village" has two different meanings: natural village and administrative village. Ownership may also be by a collective unit. In some cases, the township has emerged as the real owner of the land. Thus further uncertainty has been created. The national policy, as stated in 1984, is that the rights to use land are to be assigned for fifteen years; this followed a trial period in which the rights generally had been

assigned for three years (Du, 1989, p.82). Villages, from what I have known personally and from the various reports I have studied, have not assigned land rights for more than three years. The security of land use rights is important because of its effect on the willingness of farmers to invest in both maintaining and improving the land. An important issue is whether or not that right exists for an extended period of time for particular pieces of land. The criteria of allocation of land among households is different in different area, some based on number of workers in the household, others based on number of members of the household. Even if a household's share of the land in the village remains unchanged, the household cannot be sure that it will be reassigned the same land that it had been farming. Consequently, long-term investment in improving the land is discouraged.

Another problem is individual farmer's behavior, which results in significantly decreasing in the use of organic fertilizer and in increasing negligence of land fertility. In the worst places, farmland is allowed to run fallow and is left in an almost completely wild state. There is a lack of interest in investing in agriculture. In coastal provinces, there is low motivation for agricultural production and a large decline in investment in the land.

Foreign trade serves as a channel through which resources are transferred from consumption to investment by the exchange of agricultural inputs. Agricultural goods are exported in

exchange for imports of industrial machinery, equipment, and fertilizer which are unavailable at home. The amount of resources thus transferred is closely related to the amount of investment goods that had to be imported. Therefore, the level of foreign trade is influenced considerably by the degree of the farmers' investment in the land which is affected by the government policy concerning ownership of the land.

Finally, there is the problem of shrinkage of available farm land. This shrinkage is more critical for China than many nations, because there is no reserve of land that can be converted in agriculture use. Therefore, China must find increasingly productive ways to use the remaining lands and/or increasingly import of agricultural goods.

According to the State Land Administration, 440,000 hectares of arable land were lost in 1988; 480,000 hectares in 1987, 640,000 hectares in 1986, and about one million hectares in 1985. It is estimated that about 15 million hectares of arable land have been lost in the last 30 years. Meanwhile, the Chinese population has increased by 13 million each year since the founding of the People's Republic of China in 1949. The result is that the country had just 0.087 hectares of arable land per person in 1987, less than half the 1952 figure which was 0.19. There are several reason for loss land, such as, industry construction, urban expansion, building of roads, the development of township and rural enterprises, and the

fact that more farmers are now building their own houses. Additionally, a great deal of land has been lost as a result of soil erosion, the spreading of desert areas, and population growth. Finally, according to the Chinese Environmental Department, about 22 million hectares of land have been polluted to various degrees. Industry also poses a growing threat to agriculture. As a result of lack of concern for environmental protection, farmland suffers from waste material, waste gases and waste water released from factories which do not have sufficient skills or facilities to dispose of them properly. Unrestricted development of mining, timber cutting and other resource-based industries also contributes to the problem.

In addition to problems involving land are those of incomplete price reform. The failure to achieve significant reform of the industrial price structure has imposed substantial costs on agriculture as agriculture depends on purchased inputs from industry. The various procurement agencies do not have enough cash to pay for all the grain that they force the peasants to deliver, and only pay for 50 percent of grain delivered, the other 50 percent being paid with an IOU. According to a report quoted by Johnson (1990, p.98), the grain markets have not yet opened in full scale. Even after satisfying the purchase quotas, households in some localities cannot engage in buying and selling excess grain outside the county because there are still various kinds of checkpoints at

the border. The farmers' ability to invest in their land (or to demand machinery and input materials) is dependent on how much they earn from their production, as there is no government financing for their investment. Thus the failure to achieve significant reform of industrial prices adds a barrier to the development of farm markets and directly reduces the ability of farmers to invest in agriculture, which has an adverse impact on foreign trade.

#### Structural Adjustment Impact on Supply

Prices have a strong impact on the quantity supplied. The free-market structural adjustment environment works and prices play their role in the agricultural sector. Input factors were positively related to the free market supply (except fertilizer), land was significant. Institutional adjustment represented by the HRS strongly suggests that the fewer the distortions farmers have to adjust to, the higher the work effort exerted for the market. In contrast, before structural adjustment in China, agricultural prices were strictly controlled by the state, and prices did not reflect the monetary value of commodities. That is, the contract system of land distribution and the greater availability of other inputs in the more open environment are important factors in supply response.

### Structural Adjustment Impact on Demand

The overall effect of structural adjustment on urban and rural consumers is different. Home produced consumption in the rural sector and rationed goods in the urban are substitutes for market goods. The more access the farmers have to inputs, the more choice they have in terms of both production and consumption. Income elasticities in rural areas are greater than in urban areas.

The estimated urban demand equation suggests that policy makers should abolish rationing system. The price of rationed goods is usually below the market equilibrium price. As the consequences, there is more income available for other goods which can be purchased freely (spillover effect), rationing indirectly increase demand for other unrationed goods, which in turn, effects resources allocation. Abolishing the rationing policy and gradually reduce grain subsidies could eliminate these kind of price and quantity distortion.

From a policy perspective the model estimations suggest that Chinese officials should put further emphasis on the gradually eliminate of restriction on prices--such as quota prices, above quota prices, rationed prices, etc., and let markets play their regulatory role. On the input side too, the freer the market the greater the supply response in commodity markets. Restrictions on the fertilizer supply imposed by the government should be removed and the rights of production and marketing given to producers. A break from the



current land contract system toward greater commercialization and privatization is also needed. Land ownership would give greater confidence to farmers for investment in land and improve their efficiency in land use. The positive sign of the institutional adjustment variable HRS suggests to the policy maker that the fewer the distortion on the farm organization, the higher the work effort exerted to the market. The institutional adjustment also reflect on intensive use of land and pattern of crop production. Thus complete institutional reform, could stimulate the economy.

#### Suggestions and Possible Extensions

Although this study was both theoretically and empirically satisfactory and all the objectives were accomplished, there are interesting areas which can be explored in further research. First, the development of an empirical model which can reflect both the planned and market sides of the economy. Second, by using data from the whole period from 1949 to 1991 (which are listed in Appendix B), an estimation could be made of two sets of commodities which can reflect the economy before and after structural adjustment; such commodities could be a commodity strictly under state quota constraint (such as grain) and another under free market allocation (such as fruit). A comparison can be made of the changes in their responses to supply and demand after structural adjustment.

This kind of analysis could be done either for aggregated commodities or individual commodities.

This type of empirical model is important for the following reasons: (1) to fill an area which has never been studied before, (2) to examine the impact of structural adjustment on demand and supply of those commodities, (3) to facilitate the evaluation of policy alternatives for structural adjustment within economies, and (4) to be an aid to the policy maker.

Also, the analytical method which was applied in this study is applicable to the problems of the former Soviet Union and Eastern European countries. One can analyze factors of structural adjustment impact on agricultural supply and demand and, by identifying these factors, one can give meaningful suggestions to policy makers about how to make decision on further economic reform.

APPENDIX A  
DATA USED IN THIS STUDY

TABLE A-1. SUMMARY DATA USED ON THIS STUDY

	1	2	3	4	5	6	7	8	9
		Per Cap. Value of Market Supply (Y)	Rural Per Cap. Market Demand (Y)	Urban Per Cap. Market Demand (Y)	Market Price Index 1978=100	Index of Manufactured Input Price 1978=100	% of Production Team in HRS	Multiple Cropping Index	% of Area Devoted to Nongrain Crops
1978		38.52	32.07	7.00	100	100.0	0.00	1.51	0.096
1979		43.57	35.82	8.38	95	100.1	0.01	1.49	0.099
1980		43.44	36.24	8.72	97	100.9	0.14	1.47	0.109
1981		49.33	39.84	10.06	103	101.9	0.45	1.47	0.121
1982		57.98	45.86	12.29	106	103.6	0.80	1.47	0.130
1983		52.09	39.63	10.93	111	104.6	0.98	1.46	0.123
1984		57.97	42.60	12.74	110	107.8	0.99	1.47	0.134
1985		67.87	49.04	15.24	129	111.3	0.99	1.48	0.156
1986		74.87	52.15	16.95	140	114.8	0.99	1.50	0.141
1987		89.75	62.04	21.03	163	120.4	0.99	1.51	0.143
1988		112.77	78.21	27.21	212	138.7	0.99	1.51	0.148
1989		114.27	80.62	28.64	235	164.7	1.0	1.53	0.143
1990		157.65	110.83	39.77	222	164.7	1.0	1.55	0.144
1991		169.66	119.18	42.68	219	164.7	1.0	1.57	0.157

Table A-1---continued

	Urban Per Cap. Income	Rural Per Cap. Income	Price Index for Food Type	Market Price Index for Grain	Cultivated Land Area	Labor in Crop Production	Fertilizer Application	Per Cap. Value of Home Consumption	Per Cap. Value of Rationed Food
(Y)	(Y)	(Y)	1978=100	1978=100	(1000 ha)	(1000)	(Ton)	(Y)	(Y)
	10	11	12	13	14	15	16	17	18
1978	133.6	383.0	100.0	100.0	99390	210832.9	8840000	59.68	53.0
1979	152.0	406.0	105.5	89.6	99333	207649.0	10863000	64.37	53.0
1980	191.3	468.0	116.6	84.8	99500	203154.8	12694000	60.06	53.0
1981	233.4	500.4	120.9	85.1	100000	204309.0	13349000	72.13	59.2
1982	270.1	535.3	124.3	85.4	100000	211937.1	15134000	80.12	60.7
1983	309.8	572.9	127.3	83.2	98362	214271.0	16598000	88.10	61.6
1984	355.3	660.1	130.6	74.5	98362	205446.4	17398000	97.38	63.1
1985	397.6	748.9	149.4	75.8	96850	191211.3	17758000	106.97	60.2
1986	423.8	910.0	160.4	91.4	96230	189815.6	19306000	112.56	64.8
1987	462.6	1012.2	176.6	107.9	95890	187380.9	19993000	117.77	66.9
1988	544.9	1192.1	217.2	134.0	95720	175839.0	21414000	127.74	75.7
1989	601.5	1387.8	252.4	183.0	95660	182318.4	23571000	138.06	81.9
1990	686.3	1522.8	253.1	149.0	95670	195015.6	25903000	143.77	84.5
1991	708.6	1713.1	258.2	128.1	95670	194861.9	28051000	143.77	105.5

Sources: China Statistical Yearbook, Various Issues.

A Statistical Survey of China, 1992.

Agricultural Statistics of the People's Republic of China, 1949-90.

China Price Statistics, Various Issues.

TABLE A-2. DATA USED ON THIS STUDY

Year	Grain			Value of		Edible		Value of		Cotton		Value of
	Procurement	Quantity	Purchase	Grain	Oil	Vegetable	Purchase	Oil	Procurement	Quantity	Purchase	Cotton
	1000tn		(\$/tn)	(1000Y)	(1000tn)	(1000tn)	(\$/tn)	(\$/tn)	(1000Y)	(1000tn)	(\$/tn)	(1000Y)
1	2	3	4=2*3	5	6	7=4*6	8	9	10=8*9			
1978	61740	263	16237620	1155	1746	2017092	2043	2278	4653954			
1979	71985	331	23827035	1530	2458	3761046	2159	2680	5786120			
1980	72985	361	26347585	1953	2641	5157482	2681	3174	8509494			
1981	78055	382	29817010	2791	2819	7867271	2910	3116	9067560			
1982	91860	395	36284700	3080	1387	4270420	3497	3226	11281322			
1983	119855	393	47103015	2625	2654	6967275	4481	3422	15333982			
1984	141690	396	56109240	3225	1312	4231523	6001	3418	20511418			
1985	107628	416	44773248	4098	2701	11069518	4319	3218	13898542			
1986	115162	466	53665492	4270	2846	12152335	3794	3216	12201504			
1987	120920	509	61548280	4411	3078	13576176	4071	3563	14504973			
1988	119953	564	67653492	3953	3676	14530042	3778	4002	15119556			
1989	121381	750	91035750	3807	4318	16437865	3306	4951	16368006			
1990	139952	716	100205632	4703	4425	20810305	4091	6341	25941031			
1991	136355	673	91766915	4770	4159	19840367	5290	6721	35556523			

Table A-2--continued

	Total procru Value of Agg.Ag.Goc (billion Y)	Total Value of Ag.Good (billion Y)	% of 11 to 12	After Total Procurement (billion Y)	Per Cap. Value of Rural Home Consumption (Y)	Rural Population (1000)	Home Consumption (billion Y)	Total Value of Rural Consumption (billion Y)	Total Value of Market Supply (billion Y)
	11=4+7+11	12	13=11/12	14=12-11	15	16	17=15*16 18=12-11-17		
1978	22.9	107.2	0.21	84.3	59.68	790140		47.16	37.10
1979	33.4	126.7	0.26	93.4	64.37	790470		50.88	42.47
1980	40.0	137.8	0.29	97.8	69.06	795650		54.95	42.85
1981	46.8	153.7	0.30	107.0	72.13	799010		57.63	49.35
1982	51.8	175.0	0.30	123.2	80.12	801740		64.23	58.96
1983	69.4	194.1	0.36	124.7	88.10	807340		71.13	53.61
1984	80.9	219.5	0.37	138.7	97.38	803400		78.24	60.42
1985	69.7	228.0	0.31	158.2	106.97	807570		86.39	71.85
1986	78.0	249.8	0.31	171.8	112.56	811410		91.33	80.48
1987	89.6	283.8	0.32	194.2	117.77	816260		96.13	98.03
1988	97.3	327.7	0.30	230.4	127.74	823650		105.21	125.17
1989	123.8	367.4	0.34	243.6	138.06	831640		114.82	128.79
1990	147.0	448.2	0.33	301.2	143.77	841420		120.97	180.25
1991	147.2	466.3	0.32	319.1	143.77	852800		122.61	196.51

Table A-2--continued

	Total Population		Urban Population	Per Cap. Value of Market Supply		Net Agg. Ag. Goods Import (billion Y)	Per Cap. Net Import (Y)	Total Per Capita Market Demand (Y)		% of Rural Population to Total Population	Rural Per Cap. Value of Market Purchase (Y)	Rural Per Cap. Market Demand (Y)
	(1000)	(1000)	(1000)	(Y)	(Y)	(billion Y)	(Y)	(Y)	(Y)		(Y)	(Y)
	19	20	21=18/19	22	23	24=21+23	25	26 27=24*25				
1978	962590	172450.0	38.54	0.5	0.56	39.10	0.82	18.19	32.09			
1979	975420	184950.0	43.54	0.6	0.63	44.17	0.81	24.66	35.80			
1980	987050	191400.0	43.42	1.5	1.52	44.93	0.81	31.13	36.22			
1981	1000720	201710.0	49.32	0.6	0.57	49.88	0.80	41.70	39.83			
1982	1016540	214800.0	58.00	0.2	0.17	58.17	0.79	50.42	45.88			
1983	1030080	222740.0	52.04	-1.6	-1.52	50.52	0.78	59.14	39.60			
1984	1043570	240170.0	57.90	-2.7	-2.63	55.27	0.77	64.14	42.55			
1985	1058510	250940.0	67.88	-3.8	-3.60	64.28	0.76	76.46	49.04			
1986	1075070	263660.0	74.86	-6.2	-5.78	69.08	0.75	88.61	52.14			
1987	1093000	276740.0	89.69	-7.3	-6.67	83.02	0.75	101.90	62.00			
1988	1110260	286610.0	112.74	-8.2	-7.35	105.39	0.74	126.83	78.18			
1989	1127040	295400.0	114.27	-5.6	-5.01	109.26	0.74	151.52	80.62			
1990	1143330	301910.0	157.65	-8.1	-7.05	150.60	0.74	151.39	110.83			
1991	1158230	305430.0	169.66	-9.0	-7.79	161.87	0.74	151.39	119.18			



Table A-2--continued

	Urban Per Cap. Market Demand	Market Price Index 1978=100	Index of Manufactured Input Price 1978=100	% of Production Team in HRS	Multiple Cropping Index %	% of Area Devoted to Nongrain Crops	Urban Per Capita Income (Y)	Rural Per Cap. Income (Y)	National Retail Price Index Food Type 1978=100
	28=24-27	29	30	31	32	33	34	35	36
1978	7.00	ERR	109.8	0.00	151.0	12.0	133.6	383.0	163.5
1979	8.38	ERR	109.9	0.01	149.2	12.4	152.0	406.0	172.5
1980	8.71	ERR	110.8	0.14	147.4	13.6	191.3	468.0	190.6
1981	10.05	ERR	111.9	0.45	146.6	15.3	233.4	500.4	197.7
1982	12.29	ERR	113.7	0.80	146.7	16.6	270.1	535.3	203.2
1983	10.92	ERR	114.8	0.98	146.4	15.6	309.8	572.9	208.1
1984	12.72	ERR	118.4	0.99	146.9	17.1	355.3	660.1	213.5
1985	15.24	ERR	122.2	0.99	148.4	20.6	397.6	748.9	244.2
1986	16.94	ERR	126.1	0.99	150.0	18.3	423.8	910.0	262.3
1987	21.02	ERR	132.2	0.99	151.3	18.6	462.6	1012.2	288.8
1988	27.21	ERR	152.3	0.99	151.4	19.5	544.9	1192.1	355.2
1989	28.64	ERR	180.8	1.0	153.1	18.7	601.5	1387.8	412.7
1990	39.77	ERR	180.8	1.0	155.1	18.9	686.3	1522.8	413.9
1991	42.69	ERR	180.8	1.0	156.9	20.9	708.6	1713.1	422.2

Table A-2---continued

	Rural Per Cap. Food Expenditure (Y)	% of Home Consumption to Total	Cultivated Land (1000ha)	Agriculture Labor (1000)	Percent of Crop of Total Value of Agricultural %	Labor in Cropping Sector (1000s)	Three Year Average of Labor In Cropping sector	Fertilizer Application (Ton)	Per Cap. Value of Home Consumption (Y)	Per Cap. Value of Rationed Food (Y)
	37	38=15/37	39	40	41	42=41*40	43	44	45	46
1978	77.9	0.77	99390	274880	76.71	210860	207270.4	8840000	59.68	53.00
1979	89.0	0.72	99333	278350	74.65	207788	207270.4	10863000	64.37	53.00
1980	100.2	0.69	99500	283430	71.68	203163	207270.4	12694000	60.06	53.00
1981	113.8	0.63	100000	289800	70.50	204309	210152.3	13349000	72.13	59.20
1982	130.5	0.61	100000	300620	70.48	211877	210152.3	15134000	80.12	60.70
1983	147.2	0.60	98362	303500	70.60	214271	210152.3	16598000	88.10	61.60
1984	161.5	0.60	98362	300800	68.30	205446	195430.2	17398000	97.38	63.10
1985	183.4	0.58	98850	303510	62.99	191181	195430.2	17758000	106.97	60.20
1986	201.2	0.56	96230	304680	62.25	189663	195430.2	19396000	112.56	64.80
1987	219.7	0.54	95890	308700	60.70	187381	181847.1	19993000	117.77	66.90
1988	254.6	0.50	95720	314560	55.87	175745	181847.1	21414000	127.74	75.70
1989	289.6	0.48	95660	324410	56.23	182416	181847.1	23571000	138.06	81.90
1990	295.2	0.49	95670	333360	58.49	194982	195195.6	25903000	143.77	84.50
1991	295.2	0.49	95670	341863	57.16	195409	195195.6	28051000	143.77	105.50

Sources: China Statistical Yearbook, Various Issues.

A Statistical Survey of China, 1992.

Agricultural Statistics of the People's Republic of China, 1949-90.

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APPENDIX B  
CHINA AGRICULTURAL STATISTICS 1949-91

TABLE B-1. POPULATION AND LABOR FORCE

Year	Total Population	Urban Population	Rural Population	Rural Labor Force
1	2	3	4	5
1949	541670	57650	484020	165490
1950	551960	61690	490270	N/A
1951	563000	66320	496680	N/A
1952	574820	71630	503190	182430
1953	587960	78260	509700	186100
1954	602660	82490	520170	190880
1955	614650	82850	531800	195260
1956	628280	91850	536430	200250
1957	646530	99490	547040	205660
1958	659940	107210	552730	213000
1959	672070	123710	548360	207840
1960	662070	130730	531340	197610
1961	658590	127070	531520	202540
1962	672950	116590	556360	213730
1963	691720	116460	575260	220370
1964	704990	129500	575490	229080
1965	725380	130450	594930	235340
1966	745420	133130	612290	244510
1967	763680	135480	628200	253680
1968	785340	138380	646960	262850
1969	806710	141170	665540	274000
1970	829920	144240	685680	281200
1971	852290	147110	705180	287520
1972	871770	149350	722420	286540
1973	892110	153450	738660	292640
1974	908590	155950	752640	296820
1975	924200	160300	763900	299460
1976	937170	163410	773760	301420
1977	949740	166690	783050	302500
1978	962590	172450	790140	303420
1979	975420	184950	790470	305820
1980	987050	191400	795650	313710
1981	1000720	201710	799010	322270
1982	1016540	214800	801740	332780
1983	1030080	222740	807340	342580
1984	1043570	240170	803400	353680
1985	1058510	250940	807570	370650
1986	1075070	263660	811410	379900
1987	1093000	276740	816260	390000
1988	1110260	286610	823650	400670
1989	1127040	295400	831640	409390
1990	1143330	301910	841420	420100
1991	1158230	305430	852800	430930

Sources: China Statistical Yearbook, 1992.  
Agricultural Statistics of the People's Republic of  
China, 1949-90.

TABLE B-2. AREA USED IN AGRICULTURE

Year	Cultivated	Sown	Multiple cropping index	Grain	Economic crops	Other crops
	----- 1,000 hectares-----		----- Percent-----		----- 1,000 hectares-----	
1949	97881	N/A	N/A	109959	N/A	N/A
1950	100356	N/A	N/A	114406	N/A	N/A
1951	103671	N/A	N/A	117769	N/A	N/A
1952	107919	141256	131	123979	12494	N/A
1953	108529	144035	133	126637	11659	N/A
1954	109355	147925	135	128995	12422	N/A
1955	110157	151081	137	129839	13986	N/A
1956	111825	159173	142	136339	14699	N/A
1957	111830	157244	141	133633	14460	N/A
1958	107787	151995	145	127613	13765	N/A
1959	N/A	142405	N/A	116023	13549	N/A
1960	N/A	150575	N/A	122429	12914	N/A
1961	N/A	143214	N/A	121433	9320	N/A
1962	N/A	140229	N/A	121621	8763	N/A
1963	N/A	140218	N/A	120741	10194	N/A
1964	N/A	143531	N/A	122103	11991	N/A
1965	103590	143291	138	119627	12210	N/A
1966	N/A	146829	N/A	120988	12242	N/A
1967	N/A	144943	N/A	119230	12203	N/A
1968	N/A	139827	N/A	116157	11353	N/A
1969	N/A	140944	N/A	117604	11426	N/A
1970	101100	143487	142	119267	11713	N/A
1971	N/A	145684	N/A	120846	11933	N/A
1972	N/A	147919	N/A	121209	12534	N/A
1973	100000	148547	149	121156	12795	N/A
1974	N/A	148635	N/A	120976	12888	N/A
1975	99710	149545	N/A	121062	13399	N/A
1976	N/A	149723	N/A	120743	13723	N/A
1977	N/A	149333	N/A	120400	13532	N/A
1978	99390	150104	151	120587	14440	15077
1979	99500	148477	149	119263	14767	14447
1980	N/A	146379	N/A	117234	15921	13224
1981	100000	145157	147	114958	17561	10620
1982	100000	144755	147	113396	18794	10562
1983	N/A	143993	146	114047	17761	12185
1984	N/A	144221	N/A	112884	19288	12050
1985	96850	143626	148	108845	22378	12403
1986	96850	144204	149	110933	20285	12986
1987	95889	144957	151	111268	20725	12964
1988	95722	144869	151	110123	21496	13250
1989	95656	146554	153	112205	20989	13361
1990	95673	148362	155	113466	21417	13479
1991	95673	149586	156	112314	23472	13800

Table B-2--continued

Year	Sown area percentage		
	Grain crops	Cash crops	Other
	Percentage		
1949	N/A	N/A	N/A
1950	N/A	N/A	N/A
1951	N/A	N/A	N/A
1952	87.8	10.1	0.0
1953	87.9	9.2	0.0
1954	87.2	9.6	0.0
1955	85.9	10.8	0.0
1956	85.7	10.8	0.0
1957	85.0	10.8	0.0
1958	84.0	10.8	0.0
1959	81.5	11.7	0.0
1960	81.3	10.5	0.0
1961	84.8	7.7	0.0
1962	86.7	7.2	0.0
1963	86.1	8.4	0.0
1964	85.1	9.8	0.0
1965	83.5	10.2	0.0
1966	82.4	10.1	0.0
1967	82.3	10.2	0.0
1968	83.1	9.8	0.0
1969	83.4	9.7	0.0
1970	83.1	9.8	0.0
1971	83.0	9.9	0.0
1972	81.9	10.3	0.0
1973	81.6	10.6	0.0
1974	81.4	10.7	0.0
1975	81.0	11.1	0.0
1976	80.6	11.4	0.0
1977	80.6	11.2	0.0
1978	80.3	12.0	12.5
1979	80.3	12.4	12.1
1980	80.1	13.6	11.3
1981	79.2	15.3	9.2
1982	78.3	16.6	9.3
1983	79.2	15.6	10.7
1984	78.3	17.1	10.7
1985	75.8	20.6	11.4
1986	76.9	18.3	11.7
1987	76.8	18.6	11.7
1988	76.0	19.5	12.0
1989	76.6	18.7	11.9
1990	76.5	18.9	11.9
1991	75.1	20.9	12.3

Sources: Agricultural Statistics of the People's Republic of China, 1949-91.  
China Statistical Yearbook, 1991.

TABLE B-3. PRICE STATISTICS

Year	National Retail Price Index 1950= 100				Urban Retail Price Index 1950=100			
	Year	Consumption Good Price Index	Food Price Index	Fuels Price Index	Agricultural Producer Good Price Index	Consumption Good Price Index	Food Price Index	Fuels Price Index
		1	2	3	4	5	6	7
1951	1951	112.7	109.4	130.5	102.5	114.4	111.1	125.9
1952	1952	113.3	110.9	135.9	108.2	114.5	111.3	131.1
1953	1953	115.8	118.6	140.5	113.2	120.1	120.1	135.5
1954	1954	118.5	123.1	143.3	116.2	122.7	123.9	138.2
1955	1955	119.9	124.8	148.6	115.4	126.0	125.6	143.3
1956	1956	120.4	125.0	144.9	111.0	124.0	125.7	139.8
1957	1957	122.5	128.3	150.3	110.8	124.3	129.0	140.5
1958	1958	123.3	128.9	151.8	111.2	124.6	129.6	141.1
1959	1959	123.9	130.2	157.2	113.9	125.6	130.8	142.3
1960	1960	129.2	135.5	154.4	114.3	131.3	136.1	142.5
1961	1961	151.5	165.4	172.1	121.9	160.2	174.6	154.8
1962	1962	155.6	172.6	174.6	131.7	167.2	182.2	150.6
1963	1963	145.6	156.4	167.1	128.3	151.5	172.5	148.5
1964	1964	140.9	149.6	164.4	120.4	143.2	166.0	149.6
1965	1965	138.2	150.0	160.1	114.7	141.2	164.9	151.4
1966	1966	139.3	151.5	158.7	111.0	141.8	167.2	150.6
1967	1967	138.2	152.2	158.5	106.9	140.0	165.3	148.9
1968	1968	139.1	155.2	158.5	103.9	141.7	170.9	148.9
1969	1969	138.0	154.7	158.5	103.9	141.5	169.5	148.9
1970	1970	137.8	154.3	158.5	103.9	141.2	168.9	148.9
1971	1971	139.7	154.7	156.7	101.7	143.2	169.8	148.3
1972	1972	139.4	155.1	154.1	99.9	142.5	170.1	147.6
1973	1973	141.7	155.8	153.9	99.9	146.4	171.2	147.4
1974	1974	141.9	155.9	154.1	100.1	146.5	171.5	147.3
1975	1975	143.0	156.7	154.0	100.0	148.6	173.1	147.2
1976	1976	143.4	156.3	153.8	100.1	149.2	172.3	147.2
1977	1977	147.8	161.1	154.0	100.2	157.8	182.1	147.2
1978	1978	150.0	163.5	154.1	100.1	161.8	186.7	147.4
1979	1979	153.2	172.5	154.4	100.5	164.9	190.2	147.7
1980	1980	164.0	190.6	154.7	101.5	178.3	205.7	147.8
1981	1981	168.3	197.7	155.6	103.2	183.0	211.2	148.2
1982	1982	171.5	203.2	156.8	105.2	186.9	215.6	148.5
1983	1983	173.6	208.1	158.4	108.4	190.5	223.6	149.1
1984	1984	176.6	213.5	161.9	118.0	195.3	232.5	150.4
1985	1985	193.2	244.2	168.4	123.7	219.1	270.9	157.3
1986	1986	205.8	262.3	175.0	125.1	234.4	290.4	162.0
1987	1987	221.0	288.8	181.3	133.9	255.7	325.2	167.7
1988	1988	263.0	355.2	210.5	155.6	310.2	407.2	188.3
1989	1989	309.0	412.7	268.2	185.0	359.7	465.8	225.8
1990	1990	313.9	413.9	290.2	195.2	360.5	460.2	256.7
1991	1991	323.0	425.9	335.5	200.9	371.0	475.4	296.7

Table B-3--continued

Year	Consumption Good Price Index	Rural Retail Food Price Index	Fuels Price Index	1950=100 Agricultural Producer Good Price Index	1950=100 Market Price of Consumer Goods Pmc	%Market Price > State Price	1978=100 Market Price Food Pmf
	8	9	10	11	12	13	14
1951	112.8	111.2	135.1	102.5	111.2	N/A	N/A
1952	112.0	108.1	140.7	108.2	111.0	N/A	N/A
1953	112.3	110.9	145.4	113.2	115.3	N/A	N/A
1954	115.2	117.9	148.3	116.2	118.0	N/A	N/A
1955	117.0	125.0	153.8	115.4	117.8	N/A	N/A
1956	117.6	123.8	150.0	111.0	117.6	N/A	N/A
1957	120.9	129.2	164.6	110.8	120.9	N/A	N/A
1958	121.6	130.2	167.1	111.2	130.4	N/A	N/A
1959	122.0	131.9	177.3	113.9	132.1	N/A	N/A
1960	126.0	134.8	171.2	114.3	151.6	N/A	N/A
1961	138.9	138.8	198.5	121.9	545.9	220.0	N/A
1962	143.1	150.7	203.2	131.7	354.8	170.0	N/A
1963	139.6	145.9	189.6	128.3	267.7	129.0	N/A
1964	138.5	147.1	184.8	120.4	186.3	36.0	N/A
1965	136.5	146.4	169.4	114.7	192.3	40.0	N/A
1966	136.5	148.0	167.2	111.0	194.6	41.0	N/A
1967	136.4	149.9	167.0	106.9	197.9	43.0	N/A
1968	136.2	149.8	167.0	103.9	197.9	43.0	N/A
1969	136.0	149.5	167.0	103.9	197.7	42.0	N/A
1970	136.0	149.5	167.0	103.9	197.7	42.0	N/A
1971	136.0	149.5	166.1	101.7	215.0	54.0	N/A
1972	136.7	148.3	160.9	99.9	232.7	67.0	N/A
1973	136.7	148.7	160.7	99.9	245.0	75.0	N/A
1974	137.0	148.7	161.2	100.1	249.5	77.0	N/A
1975	137.0	148.8	161.1	100.0	259.5	84.0	N/A
1976	137.2	148.8	160.9	100.1	269.8	90.0	N/A
1977	137.3	149.1	161.2	100.2	263.3	79.0	N/A
1978	137.4	149.5	161.0	100.1	246.0	69.0	N/A
1979	140.7	155.2	161.3	100.5	234.9	57.0	N/A
1980	149.1	166.2	161.6	101.5	239.6	47.7	N/A
1981	151.8	171.2	163.1	103.2	253.5	49.1	N/A
1982	154.3	178.7	165.1	105.2	261.9	47.8	N/A
1983	155.1	179.8	167.6	108.4	272.9	47.9	83.2
1984	156.8	182.3	171.0	118.0	271.8	42.7	74.5
1985	168.7	205.1	179.6	123.7	318.5	27.6	75.8
1986	179.0	220.5	187.1	125.1	344.3	16.9	91.4
1987	189.9	239.0	194.0	133.9	400.4	16.6	107.9
1988	222.9	289.0	227.4	155.6	521.7	17.4	134.0
1989	264.4	341.0	294.9	185.0	578.0	11.5	183.0
1990	271.5	346.8	312.6	195.2	545.1	N/A	181.2
1991	279.4	358.2	361.4	200.9	539.6	N/A	181.2



Table B-3--continued

Year	1978=100 Market Price Energy Pme	1978=100 Market Price Producer Goods Pmp	1950=100 Ag.Good Quota Price Paq	Industrial Product Rural Retail Price Index (Pir)	Ag-Ind. Product Price Parity Index Ag. Qouta P=100 (Pp)	1950=100 Food Quota Price Pfq	Cash Crop Quota Price Pcq	Ag. Crop Quota Price Index
	15	16	17	18	19	20	21	22=(20+21)/2
1951	N/A	N/A	119.6	110.2	92.1	118.3	118.4	118.4
1952	N/A	N/A	121.6	109.7	90.2	121.4	113.0	117.2
1953	N/A	N/A	132.5	108.2	81.7	137.1	112.9	125.0
1954	N/A	N/A	136.7	110.3	80.7	137.1	119.3	128.2
1955	N/A	N/A	135.1	111.9	82.8	137.3	120.0	128.7
1956	N/A	N/A	139.2	110.8	79.6	139.9	122.6	131.3
1957	N/A	N/A	146.2	112.1	76.7	141.4	126.4	133.9
1958	N/A	N/A	149.4	111.4	74.6	145.1	127.9	136.5
1959	N/A	N/A	152.1	112.4	73.9	147.0	129.9	138.5
1960	N/A	N/A	157.4	115.5	73.4	151.7	133.8	142.8
1961	N/A	N/A	201.4	121.2	60.2	191.9	140.6	166.3
1962	N/A	N/A	200.1	126.6	63.3	192.4	145.0	168.7
1963	N/A	N/A	194.4	125.3	64.5	190.9	152.9	171.9
1964	N/A	N/A	189.5	122.9	64.9	189.2	152.6	170.9
1965	N/A	N/A	187.9	118.4	63.0	190.9	152.8	171.9
1966	N/A	N/A	195.8	115.0	58.7	220.8	152.8	186.8
1967	N/A	N/A	195.5	114.1	58.4	221.1	154.9	188.0
1968	N/A	N/A	195.2	113.8	58.3	221.1	154.9	188.0
1969	N/A	N/A	194.9	112.1	57.5	221.1	154.9	188.0
1970	N/A	N/A	195.1	111.9	57.4	221.1	154.9	188.0
1971	N/A	N/A	198.3	110.2	55.6	222.0	161.4	191.7
1972	N/A	N/A	201.1	109.6	54.5	222.2	164.2	193.2
1973	N/A	N/A	202.8	109.6	54.0	222.2	164.9	193.6
1974	N/A	N/A	204.5	109.6	53.6	222.4	165.1	193.8
1975	N/A	N/A	208.7	109.6	52.5	222.8	165.1	194.0
1976	N/A	N/A	209.7	109.7	52.3	222.8	165.1	194.0
1977	N/A	N/A	209.2	109.8	52.5	222.8	165.8	194.3
1978	N/A	N/A	217.4	109.8	50.5	224.4	174.0	199.2
1979	N/A	N/A	265.5	109.9	41.4	271.3	200.4	235.9
1980	N/A	N/A	284.4	110.8	39.0	271.8	210.8	241.3
1981	N/A	N/A	301.2	111.9	37.2	283.5	215.0	249.3
1982	N/A	N/A	307.8	113.7	36.9	283.5	215.2	249.4
1983	128.5	121.8	321.3	114.8	35.7	283.8	215.4	249.6
1984	133.8	130.0	334.2	118.4	35.4	282.4	212.8	247.6
1985	153.5	150.8	362.9	122.2	33.7	522.2	277.3	399.8
1986	178.2	157.0	386.1	126.1	32.7	573.9	287.3	430.6
1987	207.4	174.4	432.4	132.2	30.6	619.8	296.8	458.3
1988	269.4	249.7	531.9	152.3	28.6	710.3	330.3	520.3
1989	326.0	257.2	611.7	180.8	29.6	901.4	385.5	643.5
1990	316.2	N/A	595.8	180.8	29.6	840.1	431.4	635.8
1991	316.2	N/A	583.9	180.8	29.6	788.0	438.3	613.2

Sources: China Statistical Yearbook, Various Issues.

A Statistical Survey of China, 1992.

China Price Statistical Yearbook, Various Issues.

Note: 1991 price is estimated based on percentage growth from 1990.

TABLE B-4. AGGREGATED AGRICULTURAL GOODS SUPPLY AND DEMAND

Year	Gross val. of Agriculture (billion Y)	Gross val. of Crop % of Gross Val of Agriculture. (%)	Gross Val. of Crop (billion Y)	Above Quota Price Index 1978=100
1	2	3	4=2*3	5
1949	32.6	74.0	24.1	N/A
1950	34.8	74.0	25.8	N/A
1951	42.0	74.0	31.1	118.4
1952	46.1	73.5	33.9	119.6
1953	51.0	73.0	37.2	134.9
1954	53.5	73.0	39.1	136.5
1955	57.5	73.0	42.0	138.8
1956	61.0	73.0	44.5	140.6
1957	53.7	71.4	38.3	144.4
1958	56.6	71.4	40.4	146.3
1959	49.7	71.4	35.5	162.4
1960	45.7	71.4	32.6	183.2
1961	55.9	71.4	39.9	185.1
1962	58.4	76.8	44.8	185.0
1963	64.2	76.8	49.3	185.5
1964	72.0	76.8	55.3	204.9
1965	83.3	75.6	63.0	253.8
1966	91.0	75.6	68.8	254.8
1967	92.4	75.6	69.9	255.3
1968	92.8	75.6	70.2	255.3
1969	94.8	75.6	71.7	255.3
1970	105.8	75.7	80.0	438.5
1971	110.7	75.7	83.7	442.4
1972	112.3	75.7	85.0	443.1
1973	122.6	75.7	92.7	442.9
1974	127.7	75.7	96.6	443.9
1975	134.3	76.7	103.0	444.5
1976	137.8	77.0	106.1	445.7
1977	140.0	77.0	107.8	448.6
1978	156.7	76.7	120.2	575.5
1979	189.6	74.6	141.4	620.5
1980	218.0	71.7	156.3	619.2
1981	246.0	70.5	173.4	637.3
1982	278.5	70.5	196.3	629.5
1983	312.3	70.6	220.5	635.6
1984	321.4	68.3	219.5	618.6
1985	361.9	63.0	228.0	870.5
1986	401.3	62.3	249.8	937.0
1987	467.6	60.7	283.8	1037.1
1988	586.5	55.9	327.7	856.4
1989	653.5	56.2	367.5	1103.6
1990	766.2	58.5	448.2	1044.1
1991	815.7	57.0	464.9	983.6

Table B-4--continued

Year	Market Price Index 1950= 100	Index of Manufactured Input Price 1950= 100	% of Production Team in HRS (%)	Multiple Cropping Index % (%)	Export of Agg. Ag. Good (1000 Y)
	6	7	8	9	10
1949	N/A	N/A	0.00	144.3	121770.12
1950	N/A	100	0.00	140.8	121770.12
1951	111.2	110.2	0.00	136.0	103402.56
1952	111.0	109.7	0.00	131.0	113266.62
1953	115.3	108.2	0.00	133.0	115987.74
1954	118.0	110.3	0.00	135.0	118028.58
1955	117.8	111.9	0.00	137.0	118028.58
1956	117.6	110.8	0.00	142.0	115307.46
1957	120.9	112.1	0.00	141.0	114287.04
1958	130.4	111.4	0.00	145.0	113266.62
1959	132.1	112.4	0.00	132.1	115987.74
1960	151.6	115.5	0.00	139.7	114627.18
1961	545.9	121.2	0.00	132.9	105103.26
1962	354.8	126.6	0.00	130.1	103402.56
1963	267.7	125.3	0.00	130.1	201220.68
1964	186.3	122.9	0.00	133.2	284538.0
1965	192.3	118.4	0.00	138.0	412702.38
1966	194.6	115.0	0.00	141.7	235661.25
1967	197.9	114.1	0.00	139.9	195455.7
1968	197.9	113.8	0.00	135.0	187463.32
1969	197.7	112.1	0.00	136.1	216180.86
1970	197.7	111.9	0.00	141.9	179848.14
1971	215.0	110.2	0.00	144.7	297039.57
1972	232.7	109.6	0.00	147.0	670240.81
1973	245.0	109.6	0.00	148.2	946543.5
1974	249.5	109.6	0.00	148.7	1168215.3
1975	259.5	109.6	0.00	150.0	919905.29
1976	269.8	109.7	0.00	150.6	869861.38
1977	263.3	109.8	0.00	150.5	1211181.84
1978	246.0	109.8	0.00	151.0	1446955.16
1979	234.9	109.9	0.01	149.2	1728659.2
1980	239.6	110.8	0.14	147.4	2610083.66
1981	253.5	111.9	0.45	146.6	2644084.98
1982	261.9	113.7	0.80	146.7	1813388.16
1983	272.9	114.8	0.98	146.4	686346.92
1984	271.8	118.4	0.99	146.9	533247.48
1985	318.5	122.2	0.99	148.4	1074956.8
1986	344.3	126.1	0.99	150.0	1116185.4
1987	400.4	132.2	0.99	151.3	1922748.96
1988	521.7	152.3	0.99	151.4	2171974.08
1989	578.0	180.8	1.0	153.1	3124360.02
1990	545.1	180.8	1.0	155.1	2827482.96
1991	539.6	180.8	1.0	156.9	2451443.8

Table B-4--continued

Year	Import of Agg. Ag. Good (1000 Y)	Exchange Rate (Y/\$)	Net import of Agriculture Commodity (Y)	Total Value of Supply (Y)	% of Area Devoted to Nongrain Crops (%)
	11	12	13	14=4+13	15
1949	277532.34	3.58	-0.2	23.97	N/A
1950	277532.34	3.58	-0.2	25.60	N/A
1951	235669.92	3.04	-0.1	30.95	N/A
1952	258151.59	3.33	-0.1	33.74	10.1
1953	264353.43	3.41	-0.1	37.08	9.2
1954	269004.81	3.47	-0.2	38.90	9.6
1955	269004.81	3.47	-0.2	41.82	10.8
1956	262802.97	3.39	-0.1	44.38	10.8
1957	260477.28	3.36	-0.1	38.20	10.8
1958	258151.59	3.33	-0.1	40.27	10.8
1959	264353.43	3.41	-0.1	35.34	11.7
1960	261252.51	3.37	-0.1	32.48	10.5
1961	239546.07	3.09	-0.1	39.78	7.7
1962	235669.92	3.04	-0.1	44.69	7.2
1963	244309.26	2.93	-0.0	49.23	8.4
1964	353633.64	2.82	-0.1	55.19	9.8
1965	480800.7	2.79	-0.1	62.91	10.2
1966	565306.5	2.75	-0.3	68.47	10.1
1967	561564.9	2.7	-0.4	69.49	10.2
1968	586895.88	2.68	-0.4	69.76	9.8
1969	483279.44	2.66	-0.3	71.40	9.7
1970	422040.06	2.46	-0.2	79.80	9.8
1971	508794.15	2.49	-0.2	83.53	9.9
1972	523457.8	2.33	0.1	85.10	10.3
1973	636369.3	2.1	0.3	93.06	10.6
1974	748419	2.1	0.4	97.02	10.7
1975	884801.86	1.97	0.0	103.04	11.1
1976	867288.56	1.97	0.0	106.11	11.4
1977	840762.24	1.84	0.4	108.17	11.2
1978	911481.32	1.72	0.5	120.72	12.0
1979	1114155.5	1.55	0.6	142.06	12.4
1980	1112130.04	1.49	1.5	157.76	13.6
1981	2074280.28	1.78	0.6	174.00	15.3
1982	1644391.68	1.92	0.2	196.46	16.6
1983	2256585.24	1.96	-1.6	218.91	15.6
1984	3279868.83	2.19	-2.7	216.77	17.1
1985	4883561.6	3.2	-3.8	224.15	20.6
1986	7326506.25	3.45	-6.2	243.64	18.3
1987	9212539.08	3.72	-7.3	276.54	18.6
1988	10335138.36	3.72	-8.2	319.51	19.5
1989	8771168.64	3.81	-5.6	361.82	18.7
1990	10885320.64	4.72	-8.1	440.09	18.9
1991	11477916	5.4	-9.0	455.92	20.9

Table B-4--continued

Year	Total Population (billion)	Per Capita Consumer Demand (Y)	Total Per Capita Consumption (Y)	Natioal Retail Price Index Food Type
	16	17	18	19
1949	0.54167	44.25	60	N/A
1950	0.55196	46.37	70	100.0
1951	0.56300	54.97	76	109.0
1952	0.57482	58.69	76	110.9
1953	0.58796	63.07	87	118.6
1954	0.60266	64.55	89	123.1
1955	0.61465	68.05	94	124.8
1956	0.62828	70.64	99	125.0
1957	0.64653	59.08	102	128.3
1958	0.65994	61.02	105	128.9
1959	0.67207	52.58	96	130.2
1960	0.66207	49.06	102	135.5
1961	0.65859	60.40	114	165.4
1962	0.67295	66.41	117	172.6
1963	0.69172	71.17	116	156.4
1964	0.70499	78.29	120	149.6
1965	0.72538	86.72	125	150.0
1966	0.74542	91.85	132	151.5
1967	0.76368	90.99	136	152.2
1968	0.78534	88.82	132	155.2
1969	0.80671	88.51	134	154.7
1970	0.82992	96.15	140	154.3
1971	0.85229	98.01	142	154.7
1972	0.87177	97.62	147	155.1
1973	0.89211	104.31	155	155.8
1974	0.90859	106.79	155	155.9
1975	0.92420	111.49	158	156.7
1976	0.93717	113.22	161	156.3
1977	0.94974	113.89	165	161.1
1978	0.96259	125.42	175	163.5
1979	0.97542	145.64	197	172.5
1980	0.98705	159.83	227	190.6
1981	1.00072	173.87	249	197.7
1982	1.01654	193.26	266	203.2
1983	1.03008	212.52	289	208.1
1984	1.04357	207.72	327	213.5
1985	1.04532	214.43	403	244.2
1986	1.05851	230.17	447	262.3
1987	1.07507	257.23	508	288.8
1988	1.09300	292.33	635	355.2
1989	1.11026	325.88	691	412.7
1990	1.12704	390.49	714	413.9
1991	1.14333	398.77	798	422.2

Sources: China Statistical Yearbook, 1985, 1991.  
Agricultural Statistics of the People's Republic of  
China 1949-90.

TABLE B-5. GRAIN SUPPLY AND DEMAND

Year	Grain Total Production (1000tn)	Total Export (1000tn)	Total Import (1000tn)	Net Import (1000tn)	Total Supply (1000tn)	Total Population (1000)	Urban Population (1000)	Rural Population (1000)
	1	2	3 4=3-2		5=1+4	6	7	8
1949	111211	0	0.0	0.0	0	541670	57650.0	484020
1950	129647	1225.8	66.9	-1158.9	128488.1	551960	61690.0	490270
1951	140885	1971.1	0.0	-1971.1	138913.9	563000	66320.0	496680
1952	160649	1528.8	0.1	-1528.7	159120.3	574820	71630.0	503190
1953	163498	1826.2	14.6	-1811.6	161686.4	587960	78260.0	509700
1954	166119	1711.0	30.0	-1681.0	164438	602660	82490.0	520170
1955	180155	2233.4	182.2	-2051.2	178103.8	614650	82850.0	531800
1956	188375	2651.2	149.2	-2502.0	185873	628280	91850.0	536430
1957	190661	2092.6	166.8	-1925.8	188735.2	646530	99490.0	547040
1958	193454	2883.4	223.5	-2659.9	190794.1	659940	107210.0	552730
1959	165236	4157.5	2.0	-4155.5	161080.5	672070	123710.0	548360
1960	139430	2720.4	66.3	-2654.1	136775.9	662070	130730.0	531340
1961	143154	1355.0	5809.7	4454.8	147608.8	658590	127070.0	531520
1962	155310	1030.9	4923.0	3892.1	159202.1	672950	116590.0	556360
1963	165722	1490.1	5952.0	4461.9	170183.9	691720	116460.0	575260
1964	187500	1820.8	6570.1	4749.3	192249.3	704990	129500.0	575490
1965	194525	2416.5	6405.2	3988.8	198513.8	725380	130450.0	594930
1966	214000	2885.0	6437.8	3552.8	217552.8	745420	133130.0	612290
1967	217820	2994.4	4701.9	1707.5	219527.5	763680	135480.0	628200
1968	209055	2601.4	4596.4	1995.0	211050	785340	138380.0	646960
1969	210970	2237.5	3786.3	1548.8	212518.8	806710	141170.0	665540
1970	239955	2119.1	5359.6	3240.5	243195.5	829920	144240.0	685680
1971	250140	2617.5	3173.2	555.7	250695.7	852290	147110.0	705180
1972	240480	2925.6	4756.2	1830.7	242310.7	871770	149350.0	722420
1973	264935	3893.1	8127.9	4234.8	269169.8	892110	153450.0	738660
1974	275270	3643.9	8121.3	4477.4	279747.4	908590	155950.0	752640
1975	284515	2806.1	3735.0	928.9	285443.9	924200	160300.0	763900
1976	286305	1764.7	2366.5	601.7	286906.7	937170	163410.0	773760
1977	282725	1657.0	7344.8	5687.8	288412.8	949740	166690.0	783050
1978	304765	1877.2	8832.5	6955.3	311720.3	962590	172450.0	790140
1979	332115	1650.8	12355.3	10704.5	342819.5	975420	184950.0	790470
1980	320560	1618.3	13429.3	11811.0	332371	987050	191400.0	795550
1981	325020	1260.8	14812.2	13551.4	338571.4	1000720	201710.0	799010
1982	354500	1251.2	16116.9	14865.7	369365.7	1016540	214800.0	801740
1983	387275	1963.1	13435.1	11472.0	398747	1030080	222740.0	807340
1984	407310	3190.0	10410.0	7220.0	414530.0	1043570	240170.0	803400
1985	379108	9320.0	6000.0	-3320.0	375788.0	1058510	250940.0	807570
1986	391510	9420.0	7730.0	-1690.0	389820.0	1075070	263660.0	811410
1987	402980	7370.0	16280.0	8910.0	411890.0	1093000	276740.0	816260
1988	394080	7170.0	16580.0	9410.0	403490.0	1110260	286610.0	823650
1989	407550	6560.0	15330.0	8770.0	416320.0	1127040	295400.0	831640
1990	446240	5830.0	13720.0	7890.0	454130.0	1143330	301910.0	841420
1991	435290	10860.0	13450.0	2590.0	437880.0	1158230	305430.0	852800

Table B-5--continued

Year	Total Demand (KG)	Urban Demand (KG)	Rural Demand (KG)	Quota Price 1950=100	Above Quota Price 1950=100	Market Price 1978=100	Multiple Crop Index	% of Area In Nongrain Crops
	9=5/6	10	11	12	13	14	15	16
1949	0.0	0.0	0.0	0.0	0.0	N/A	144.3	N/A
1950	232.8	240.5	191.5	100.0	100.0	N/A	140.8	N/A
1951	246.7	242.0	190.5	118.3	118.4	N/A	136.0	N/A
1952	276.8	236.0	190.0	121.4	121.4	N/A	131.0	10.1
1953	275.0	214.5	195.5	137.1	137.2	N/A	133.0	9.2
1954	272.9	200.5	205.0	137.1	137.3	N/A	135.0	9.6
1955	289.8	196.0	204.5	137.3	139.9	N/A	137.0	10.8
1956	295.8	185.5	201.0	139.9	141.4	N/A	142.0	10.8
1957	291.9	201.0	183.0	141.4	145.1	N/A	141.0	10.8
1958	289.1	192.5	156.0	145.1	147.1	N/A	145.0	10.8
1959	239.7	179.5	153.5	147.0	166.9	N/A	132.1	11.7
1960	206.6	184.0	160.5	151.7	192.0	N/A	139.7	10.5
1961	224.1	190.0	159.5	191.9	192.5	N/A	132.9	7.7
1962	236.6	200.0	178.5	192.4	190.9	N/A	130.1	7.2
1963	246.0	210.0	177.0	190.9	189.3	N/A	130.1	8.4
1964	272.7	206.0	186.5	189.2	214.0	N/A	133.2	9.8
1965	273.7	199.5	183.5	190.9	275.7	N/A	138.0	10.2
1966	291.9	189.0	171.0	220.8	277.1	N/A	141.7	10.1
1967	287.5	191.5	170.5	221.1	277.1	N/A	139.9	10.2
1968	268.7	202.0	184.5	221.1	277.1	N/A	135.0	9.8
1969	263.4	199.5	186.0	221.1	277.1	N/A	136.1	9.7
1970	293.0	206.0	166.0	221.1	288.8	N/A	141.9	9.8
1971	294.1	208.0	188.5	222.0	289.0	N/A	144.7	9.9
1972	278.0	204.5	184.5	222.2	289.0	N/A	147.0	10.3
1973	301.7	209.5	187.0	222.2	289.3	N/A	148.2	10.6
1974	307.9	212.0	186.0	222.4	289.8	N/A	148.7	10.7
1975	308.9	210.5	188.5	222.8	289.8	N/A	150.0	11.1
1976	306.1	205.5	189.0	222.8	289.8	N/A	150.6	11.4
1977	303.7	211.0	206.0	222.8	291.9	N/A	150.5	11.2
1978	323.8	214.0	214.0	224.4	407.1	100.0	151.0	12.0
1979	351.5	215.5	220.0	271.3	407.0	89.6	149.2	12.4
1980	336.7	217.5	227.5	271.8	407.7	84.8	147.4	13.6
1981	338.3	221.5	234.5	283.5	425.3	85.1	146.6	15.3
1982	363.4	216.8	260.0	283.5	425.3	85.4	146.7	16.6
1983	387.1	216.7	260.0	283.8	425.7	83.2	146.4	15.6
1984	397.2	213.1	267.0	282.4	423.6	74.5	146.9	17.1
1985	355.0	196.7	257.0	522.2	783.3	75.8	148.4	20.6
1986	362.6	206.8	259.0	573.9	860.9	91.4	150.0	18.3
1987	376.8	200.8	259.0	619.8	929.7	107.9	151.3	18.6
1988	363.4	205.8	260.0	710.3	1065.5	134.0	151.4	19.5
1989	369.4	200.9	262.0	901.4	1352.1	183.0	153.1	18.7
1990	397.2	196.1	262.0	840.1	1260.2	149.0	155.1	18.9
1991	234.5	196.0	234.5	788.0	1182.0	128.1	156.9	20.9

Table B-5--continued

Year	HRS	Manufactured Input Price 1950=100	Per Cap. Rural Expenditure	Per Cap. Urban Expenditure	1950=100 Retail Price of Sideline Food Rural	Retail Price of Sideline Food Urban	Fertilizer Application (1000Tn)
	17	18	19	20	21	22	23
1949	0.00	N/A	0.0	0.0	0	0	0
1950	0.00	100.0	0.0	0.0	100	100	0
1951	0.00	110.2	0.0	0.0	115	115	0
1952	0.00	109.7	62.0	149.0	110.3	110.3	78
1953	0.00	108.2	69.0	181.0	121.9	124.4	116
1954	0.00	110.3	70.0	183.0	129.6	132.2	160
1955	0.00	111.9	76.0	188.0	130.6	132.6	244
1956	0.00	110.8	78.0	197.0	131.5	134.2	333
1957	0.00	112.1	79.0	205.0	137.7	140.5	373
1958	0.00	111.4	83.0	195.0	140.0	140.9	546
1959	0.00	112.4	65.0	206.0	143.6	143.5	538
1960	0.00	115.5	68.0	214.0	145.4	147	662
1961	0.00	121.2	82.0	225.0	175.8	182.4	448
1962	0.00	126.6	88.0	226.0	175.6	178.6	630
1963	0.00	125.3	89.0	222.0	171.7	174.2	1043
1964	0.00	122.9	95.0	234.0	169.4	173.7	1290
1965	0.00	118.4	100.0	237.0	167.8	168.6	1942
1966	0.00	115.0	106.0	244.0	165.1	172.6	2655
1967	0.00	114.1	110.0	251.0	167.5	170.7	2661
1968	0.00	113.8	106.0	250.0	167.5	167.1	1995
1969	0.00	112.1	108.0	255.0	167.5	167.1	2731
1970	0.00	111.9	114.0	260.0	167.5	167.1	3512
1971	0.00	110.2	116.0	267.0	167.3	167.3	3647
1972	0.00	109.6	116.0	295.0	167.5	167.4	4207
1973	0.00	109.6	123.0	306.0	167.5	167.6	5111
1974	0.00	109.6	123.0	313.0	167.5	167.6	4858
1975	0.00	109.6	124.0	324.0	167.5	167.9	5369
1976	0.00	109.7	125.0	340.0	167.5	167.9	5828
1977	0.00	109.8	124.0	360.0	167.6	167.9	6480
1978	0.00	109.8	132.0	383.0	167.7	168.2	8840
1979	0.01	109.9	152.0	406.0	175.0	174.9	10863
1980	0.14	110.8	173.0	468.0	199.2	199.2	12694
1981	0.45	111.9	192.0	520.0	202.6	204.4	13349
1982	0.80	113.7	210.0	526.0	203.8	205.8	15134
1983	0.98	114.8	232.0	547.0	206.0	210.7	16598
1984	0.99	118.4	265.0	598.0	210.0	223.3	17398
1985	0.99	122.2	324.0	727.0	241.6	274.7	17758
1986	0.99	126.1	351.0	833.0	260.9	296.7	19306
1987	0.99	132.2	389.0	991.0	292.3	338.2	19993
1988	0.99	152.3	473.0	1281.0	377.0	443.1	21414
1989	1.00	180.8	511.0	1387.0	437.4	498.9	23571
1990	1.00	189.1	522.0	1442.0	450.5	493.9	25903
1991	1.00	192.0	619.0	1453.0	459.5	503.7	28051

Sources: China Trade and Price Statistics 1952-83.  
 Agricultural Economics Materials 1949-83.  
 China Statistical Yearbook, 1985, 1991.  
 Agricultural Statistics of the People's Republic of  
 China, 1949-90.  
 China Price Statistical Yearbook, 1990.  
 Sicular, T. 1989.  
 Stone, B. 1990.



TABLE B-6. TOTAL GRAIN PRODUCTION

Year	Total	Rice	Wheat	Corn	Sorghum	Millet	Tubers	Soybean
1,000 tons								
1949	111,211	48,645	13,810	na	na	na	7,876	5,085
1950	129,647	55,100	14,495	na	na	na	9,912	7,440
1951	140,885	60,555	17,230	na	na	na	11,200	8,630
1952	160,649	68,425	18,125	16,850	11,100	11,550	13,064	9,520
1953	163,498	71,270	18,280	16,690	11,200	10,300	13,328	9,930
1954	166,119	70,850	23,335	17,140	9,000	9,250	13,584	9,080
1955	180,155	78,025	22,965	20,320	10,250	10,050	15,120	9,120
1956	188,375	82,480	24,800	23,050	6,550	8,550	17,480	10,240
1957	190,661	86,775	23,640	21,440	7,650	8,550	17,536	10,050
1958	193,454	80,850	22,585	na	na	na	26,184	8,670
1959	165,236	69,365	22,180	na	na	na	19,056	8,760
1960	139,430	59,730	22,170	na	na	na	16,280	6,390
1961	143,154	53,640	14,250	15,500	5,750	5,250	17,384	6,210
1962	155,310	62,985	16,665	16,250	6,100	5,300	18,760	6,510
1963	165,722	73,765	18,475	20,580	6,850	6,000	17,112	6,910
1964	187,500	83,000	20,840	22,690	6,700	6,850	20,130	7,870
1965	194,525	87,720	25,220	23,660	7,100	6,200	19,860	6,140
1966	214,000	95,390	25,280	na	na	na	22,530	8,270
1967	217,820	93,685	28,485	na	na	na	22,430	8,270
1968	209,055	94,530	27,455	na	na	na	22,290	8,040
1969	210,970	95,065	27,285	na	na	na	24,120	7,630
1970	239,955	109,990	29,185	33,030	8,200	8,800	26,680	8,710
1971	250,140	115,205	32,575	35,850	8,800	7,700	25,070	8,610
1972	240,480	113,355	35,985	32,100	8,050	5,950	24,520	6,450
1973	264,935	121,735	35,225	38,630	10,650	8,150	31,560	8,370
1974	275,270	123,905	40,865	42,920	11,350	7,000	28,240	7,470
1975	284,515	125,560	45,310	47,220	10,750	7,150	28,570	7,240
1976	286,305	125,810	50,385	48,160	8,700	5,550	26,660	6,640
1977	282,725	128,565	41,075	49,390	7,700	6,150	29,670	7,260
1978	304,765	136,930	53,840	55,945	8,060	6,565	31,740	7,565
1979	332,115	143,750	62,730	60,035	7,625	6,125	28,460	7,460
1980	320,560	139,910	55,210	62,600	6,775	5,445	28,730	7,940
1981	325,020	143,955	59,640	59,205	6,650	5,765	25,970	9,325
1982	354,500	161,595	68,470	60,560	6,970	6,580	26,680	9,030
1983	387,275	168,865	81,390	68,205	8,355	7,540	29,245	9,760
1984	407,310	178,255	87,815	73,410	7,715	7,025	28,475	9,695
1985	379,108	168,569	85,805	63,826	5,609	5,977	26,036	10,509
1986	391,512	172,224	90,040	70,856	5,384	4,550	25,337	11,614
1987	402,977	174,262	85,902	79,241	5,426	4,357	28,205	12,465
1988	394,081	169,107	85,432	77,351	5,594	4,412	26,965	11,645
1989	407,549	180,130	90,807	78,928	4,435	3,753	27,304	10,227
1990	446,243	189,331	98,229	96,819	5,675	4,575	27,432	11,000

<sup>1</sup> Total grain and tubers for 1949-63 are adjusted to the same 5:1 tuber to grain conversion rate used in official statistics after 1963. Total grain also includes a number of minor grains (see table 30). Except for tubers (converted to 5:1 dry weight grain basis), grains are on a rough (unprocessed) basis. See the Definitions for information on the weight basis of specific grains.

Sources: Agricultural Statistics of the People's Republic of China, 1949-90.

TABLE B-7. FRUIT SUPPLY AND DEMAND DATA

Year	Fruit Total Production (1000tn)	Total Export (1000tn)	Total Import (1000tn)	Total Supply (1000tn)	Total Population (1000)	Urban Population (1000)
	1	2	3	4	5	6
1949	1200			1200.00	541670	
1950	1325	6.9	N/A	1318.07	551960	57650
1951	1564	15.0	N/A	1549.02	563000	61690
1952	2443	35.6	N/A	2407.37	574820	66320
1953	2969	39.2	N/A	2929.83	587960	71630
1954	2978	73.8	N/A	2904.23	602660	78260
1955	2550	111.4	N/A	2438.61	614650	82490
1956	3105	133.5	N/A	2971.53	628280	82850
1957	3247	157.8	N/A	3089.24	646530	91850
1958	3900	219.9	N/A	3680.11	659940	99490
1959	4250	213.3	N/A	4036.68	672070	107210
1960	3977	191.4	N/A	3785.55	662070	123710
1961	2841	104.1	N/A	2736.93	658590	130730
1962	2712	112.5	N/A	2599.51	672950	127070
1963	2876	120.8	N/A	2755.19	691720	116590
1964	N/A	141.4	N/A	N/A	704990	116460
1965	3239	144.4	N/A	3094.61	725380	129500
1966	N/A	151.9	N/A	N/A	745420	130450
1967	N/A	161.8	N/A	N/A	763680	133130
1968	N/A	133.5	N/A	N/A	785340	135480
1969	N/A	148.7	N/A	N/A	806710	138380
1970	3745	163.2	N/A	3581.83	829920	141170
1971	3863	175.1	N/A	3687.88	852290	144240
1972	4442	195.4	N/A	4246.59	871770	147110
1973	5182	206.2	N/A	4975.84	892110	149350
1974	5153	188.9	N/A	4964.09	908590	153450
1975	5381	208.3	N/A	5172.71	924200	155950
1976	5404	172.1	N/A	5231.93	937170	160300
1977	5685	186.2	N/A	5498.75	949740	163410
1978	6570	210.4	N/A	6359.62	962590	166690
1979	7015	222.7	N/A	6792.32	975420	172450
1980	6793	220.6	N/A	6572.43	987050	184950
1981	7801	198.6	N/A	7602.44	1000720	191400
1982	7713	207.5	N/A	7505.48	1016540	201710
1983	9487	196.0	N/A	9290.96	1030080	214800
1984	9845	174.2	N/A	9670.78	1043570	222740
1985	11639	214.1	N/A	11424.89	1045320	240170
1986	13477	223.9	N/A	13253.14	1058510	250940
1987	16679	243.8	N/A	16435.21	1075070	263660
1988	16661	280.9	N/A	16380.15	1093000	276740
1989	18319	252.2	N/A	18066.83	1110260	286610
1990	18744	226.4	N/A	18517.61	1127040	295400
1991	21761	159.8	N/A	21601.24	1143330	301910

Table B-7--continued

Year	Rural Population (1000)	Total Demand (KG)	Quota Price 1950=100	Farmer Market Price Index 1978=100	National Retail Price Index of Vegetable 1950=100
	7	8	9	10	11
1949		2.2		N/A	
1950	484020	2.4	100.0	N/A	100.0
1951	490270	2.8	125.6	N/A	120.5
1952	496680	4.2	130.7	N/A	116.7
1953	503190	5.0	156.1	N/A	153.1
1954	509700	4.8	154.6	N/A	149.4
1955	520170	4.0	149.3	N/A	140.0
1956	531800	4.7	152.1	N/A	147.9
1957	536430	4.8	160.2	N/A	149.4
1958	547040	5.6	163.0	N/A	135.7
1959	552730	6.0	171.0	N/A	147.5
1960	548360	5.7	184.3	N/A	164.9
1961	531340	4.2	211.3	N/A	206.2
1962	531520	3.9	206.5	N/A	185.6
1963	556360	4.0	188.7	N/A	147.8
1964	575260	..	181.5	N/A	141.0
1965	575490	4.3	183.1	N/A	136.7
1966	594930	..	183.6	N/A	130.5
1967	612290	..	173.2	N/A	134.9
1968	628200	..	173.2	N/A	169.0
1969	646960	..	173.2	N/A	161.4
1970	665540	4.3	173.2	N/A	159.3
1971	685680	4.3	173.6	N/A	158.0
1972	705180	4.9	181.3	N/A	163.3
1973	722420	5.6	183.4	N/A	170.3
1974	738660	5.5	184.3	N/A	163.4
1975	752640	5.6	184.8	N/A	173.9
1976	763900	5.6	185.1	N/A	173.2
1977	773760	5.8	186.0	N/A	175.6
1978	783050	6.6	205.1	N/A	182.1
1979	790140	7.0	209.6	97.0	188.5
1980	790470	6.7	220.1	103.4	204.9
1981	795650	7.6	223.8	112.9	224.0
1982	799010	7.4	228.5	119.1	226.9
1983	801740	9.0	247.5	132.4	251.4
1984	807340	9.3	292.8	139.3	269.0
1985	803400	10.9	384.4	173.0	360.5
1986	807570	12.5	415.2	192.4	371.3
1987	811410	15.3	453.4	211.8	434.4
1988	816260	15.0	632.9	258.0	569.0
1989	823650	16.3	570.9	270.6	580.4
1990	831640	16.4	556.6	249.5	574.6
1991	841420	18.9	539.9	242.0	592.1

Table B-7--continued

Year	Overall Retail Other Food Price Index	Per Capita Expenditure		Index of Manufactured Input Price	% of Production Team in HRS
	1950=100	Rural (Y)	Urban (Y)	1950=100	
	12	13	14	15	16
1949	100.0	60.0	140.0	110.2	0.00
1950	100.0	61.0	140.0	110.2	0.00
1951	107.0	62.0	149.0	110.2	0.00
1952	111.3	62.0	149.0	109.7	0.00
1953	115.7	69.0	181.0	108.2	0.00
1954	112.2	70.0	183.0	110.3	0.00
1955	111.1	76.0	188.0	111.9	0.00
1956	108.9	78.0	197.0	110.8	0.00
1957	110.0	79.0	205.0	112.1	0.00
1958	108.9	83.0	195.0	111.4	0.00
1959	107.8	65.0	206.0	112.4	0.00
1960	117.5	68.0	214.0	115.5	0.00
1961	149.2	82.0	225.0	121.2	0.00
1962	153.7	88.0	226.0	126.6	0.00
1963	135.2	89.0	222.0	125.3	0.00
1964	125.2	95.0	234.0	122.9	0.00
1965	120.2	100.0	237.0	118.4	0.00
1966	115.3	106.0	244.0	115.0	0.00
1967	115.3	110.0	251.0	114.1	0.00
1968	115.3	106.0	250.0	113.8	0.00
1969	114.2	108.0	255.0	112.1	0.00
1970	113.1	114.0	260.0	111.9	0.00
1971	113.4	116.0	267.0	110.2	0.00
1972	114.3	116.0	295.0	109.6	0.00
1973	115.4	123.0	306.0	109.6	0.00
1974	115.8	123.0	313.0	109.6	0.00
1975	125.1	124.0	324.0	109.6	0.00
1976	123.8	125.0	340.0	109.7	0.00
1977	127.6	124.0	360.0	109.8	0.00
1978	130.0	132.0	383.0	109.8	0.00
1979	134.0	152.0	406.0	109.9	0.01
1980	142.0	173.0	468.0	110.8	0.14
1981	143.0	192.0	520.0	111.9	0.45
1982	145.2	210.0	526.0	113.7	0.80
1983	152.5	232.0	547.0	114.8	0.98
1984	158.5	265.0	598.0	118.4	0.99
1985	182.0	324.0	727.0	122.2	0.99
1986	193.0	351.0	833.0	126.1	0.99
1987	210.6	389.0	991.0	132.2	0.99
1988	252.7	473.0	1281.0	152.3	0.99
1989	305.8	511.0	1387.0	180.8	1.00
1990	312.0	522.0	1442.0	189.1	1.00
1991	321.4	619.0	1453.0	192.0	1.00

Sources: Agricultural Statistics of the People's Republic of China, 1949-90.

China Trade and Price Statistics 1952-83.

China Statistical Yearbook, 1991.

TABLE B-8. FRUIT PRODUCTION

Year	Total	Apple	Banana	Citrus <sup>2</sup>	Pear	Grape	Other <sup>3</sup>
1,000 tons							
1949	1,200	na	na	na	na	na	na
1950	1,325	na	na	na	na	na	na
1951	1,564	na	na	na	na	na	na
1952	2,443	118	110	207	394	48	1,566
1953	2,969	139	116	255	531	66	1,862
1954	2,978	174	145	329	241	76	2,013
1955	2,550	203	97	284	409	64	1,493
1956	3,105	221	99	318	536	80	1,851
1957	3,247	222	73	322	504	85	2,041
1958	3,900	297	159	412	797	112	2,123
1959	4,250	320	175	415	925	125	2,290
1960	3,977	296	140	311	587	103	2,540
1961	2,841	167	48	169	481	70	1,906
1962	2,712	225	35	206	443	84	1,719
1963	2,876	248	43	176	500	85	1,824
1964	na	na	99	na	499	100	na
1965	3,239	318	145	254	511	100	1,911
1966	na	na	na	na	na	na	na
1967	na	na	na	na	na	na	na
1968	na	na	na	na	na	na	na
1969	na	na	na	na	na	na	na
1970	3,745	798	166	242	654	85	1,800
1971	3,863	854	126	239	820	104	1,720
1972	4,442	850	114	308	1,048	101	2,021
1973	5,182	1,301	161	305	1,045	115	2,255
1974	5,153	1,157	104	337	1,112	104	2,339
1975	5,381	1,583	165	336	1,087	123	2,087
1976	5,404	1,730	32	281	1,233	117	2,011
1977	5,685	2,108	42	398	1,092	91	1,954
1978	6,570	2,275	85	383	1,517	104	2,206
1979	7,015	2,869	74	555	1,438	126	1,953
1980	6,793	2,363	61	713	1,466	110	2,080
1981	7,801	3,006	126	798	1,593	148	2,130
1982	7,713	2,430	201	939	1,755	186	2,202
1983	9,487	3,541	207	1,296	1,795	247	2,401
1984	9,845	2,941	300	1,499	2,100	294	2,711
1985	11,639	3,614	631	1,808	2,137	361	3,088
1986	13,477	3,337	1,251	2,548	2,348	442	3,551
1987	16,679	4,264	2,030	3,224	2,489	641	4,031
1988	16,661	4,314	1,830	2,560	2,721	792	4,414
1989	18,319	4,499	1,404	4,561	2,565	874	4,416
1990	18,744	4,319	1,456	4,855	2,353	859	4,902

<sup>1</sup> Fruit production excludes output from wild orchards and all melon-type fruits (watermelon, honeydew melon, muskmelon, cantaloupe, etc.).

<sup>2</sup> Citrus fruit includes a wide variety of oranges, tangerines, grapefruit, etc.

<sup>3</sup> Other miscellaneous fruit output is calculated as a residual.

Sources: Agricultural Statistics of the People's Republic of China, 1949-90.

TABLE B-9. FRUIT AND VEGETABLE EXPORTS

Year	Apples	Citrus fruits	Red dates	Canned fruits	Canned vegetables	Dried hot peppers
1,000 tons						
1950	0.2	5.8	0.9	0	0	0
1951	3.0	11.0	1.0	0	0	0
1952	11.7	22.8	1.1	0	0	0
1953	10.4	26.4	1.2	1.2	0.1	1.9
1954	29.5	39.8	0.8	3.7	0.1	5.9
1955	35.4	66.8	0.8	8.4	0.4	3.1
1956	47.6	70.0	1.3	14.6	3.2	8.9
1957	66.7	71.1	1.2	18.8	6.9	10.6
1958	92.4	88.2	1.2	38.1	12.8	7.7
1959	101.1	76.9	1.3	34.0	13.0	4.6
1960	107.5	63.2	1.1	19.6	6.2	2.7
1961	49.9	34.1	0.9	19.2	6.3	0.9
1962	63.5	29.7	1.0	18.3	8.1	0.5
1963	60.2	33.6	0.8	26.2	10.6	0.9
1964	75.3	37.5	1.1	27.5	11.5	3.4
1965	90.6	37.2	1.4	25.2	10.8	8.8
1966	79.9	38.8	1.5	31.7	16.9	7.0
1967	80.9	49.7	na	31.2	18.0	6.0
1968	49.0	52.7	1.3	30.5	23.5	10.6
1969	58.3	53.9	1.8	34.7	31.9	12.0
1970	70.8	50.8	1.9	39.7	29.5	9.5
1971	88.6	55.6	1.8	29.1	34.6	8.6
1972	85.4	58.7	1.8	49.5	47.5	9.1
1973	96.4	60.2	1.6	48.0	65.8	9.0
1974	90.7	52.2	2.0	44.0	84.4	10.0
1975	95.5	58.1	2.2	52.5	98.5	10.8
1976	82.7	36.3	1.3	51.8	91.6	10.9
1977	85.5	54.3	1.9	44.5	93.8	10.6
1978	94.1	62.1	2.2	52.0	112.6	11.5
1979	104.2	57.1	2.4	59.0	158.0	15.8
1980	106.2	51.6	2.4	60.4	200.5	16.9
1981	62.2	33.1	3.5	57.0	224.0	19.5
1982	63.6	43.9	4.2	56.6	241.8	22.8
1983	57.3	44.1	3.6	60.8	243.2	23.1
1984	42.1	36.4	2.9	49.9	240.8	27.4
1985	53.6	51.6	2.5	39.6	224.4	23.5
1986	48.2	61.0	2.8	46.2	273.1	24.3
1987	57.8	75.8	7.5	79.3	309.9	26.0
1988	94.6	82.6	5.1	101.6	316.7	25.9
1989	71.3	63.5	5.6	81.8	303.0	31.9

<sup>1</sup> Ministry of Foreign Economic Relations and Trade (MOFERT) statistics report only the trade carried out by trading units directly under their administrative control. The decentralization of trade during the 1980's has seen a rise in trading companies out-side the MOFERT system. Therefore, these statistics, particularly in the latter part of the 1980's, are generally lower than China's Customs Administration trade figures which report all trade crossing China's borders. However, Customs data include reexports of raw materials imported for processing, inflating both imports and exports.

Sources: Agricultural Statistics of the People's Republic of China, 1949-90.

APPENDIX C  
TWO-STAGE LEAST SQUARES RESULT

Table C-1. Two-Stage Least Square Estimates of the Supply and Demand Equation

Parameters	Estimates	Standard Errors	t-Statistics <sup>a</sup>
Supply Equation:			
$C_1$	-20.3859	3.4994	-5.8255
$P_t$	1.1212	.1355	8.2745*
$LA_t$	.1694	.2041	.8302
$FER_t$	$.26 \times 10^{-4}$	$.12 \times 10^{-2}$	.02259
$LD_t$	$.10 \times 10^{-3}$	$.19 \times 10^{-4}$	5.1963*
$HRS_t$	.2047	.1166	1.7547
$NGCA_t$	-3.7451	2.2238	-1.6841
$MCI_t$	6.5082	1.6263	4.0018*
Urban Demand:			
$C_2$	.0670	.0640	1.0468
$P_{ut}$	-.1128	.0816	-1.3819
$I_{ut}$	.0358	0.0068	5.3023*
$B_{ut}$	-.0398	.0569	-.6991
Rural Demand:			
$C_3$	.4486	.2417	1.8558
$P_{rt}$	-.1821	.3015	-.6039
$I_{rt}$	.2877	.0717	4.0115*
$Y_{3t}$	-.5123	.1413	-3.6252*
$HRS_{rt}$	-.2719	.0889	-3.0561*

a: The t-statistics marked with an \* are significant at the .05 significant level.



APPENDIX D  
HAUSMAN SPECIFICATION TEST

Table D-1. Hausman Statistics

Hausman Test <sup>a</sup>		
Equation	Chi-square test	Upper tail area <sup>b</sup>
Rural demand <sup>c</sup>	.5572	.9899
Urban demand <sup>d</sup>	.1750	.9964

a: a test of endogeneity of income.

b: area to the right of the Chi-square test statistic.

c. degrees of freedom = 4.

d. degrees of freedom = 5.

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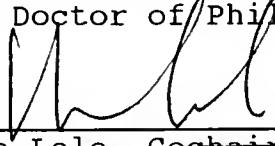
## BIOGRAPHICAL SKETCH

Gulnaz Abdukadir was born October 27, 1957, in Ill city, Xinjiang Uygur Autonomous region, the People's Republic of China. She went to primary school and high school at the same place. The cultural revolution suspended her education, and she was sent to a countryside where she lived a year and half. After the revolution was over, she passed the national college entrance exams and had a chance to become a college student at August-First Agricultural College, in the Agricultural Economics Department at Urumqi, Xinjiang, where she obtained her B.S. degree in 1982. She worked as an instructor at the same department until she started her master's program at the Department of Agricultural Economics, University of California at Davis in the fall of 1985, she obtained an M.S. degree from there two years later. She obtained another master's degree in the Department of Food and Resources Economics of the University of Florida in 1990. In the same year she transferred to the Department of Economics in the College of Business Administration, University of Florida and began her Ph.D. program. She is the first Ph.D. student to come from Xinjiang Uygur Autonomous region to the U.S.A. to study economics.

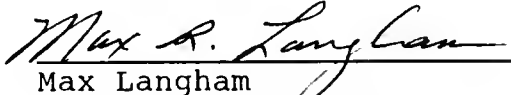
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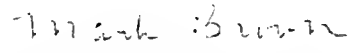
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~~Uma Lele, Cochair~~ .  
Graduate Research Professor of  
Food and Resource Economics

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Max Langham  
Professor of Economics

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